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THE STRUCTURE OF THE SUBJECTIVE LEXICON

by



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ABSTRACT

Innatism, as we understand the term, is the view that certain psychological structures are common to all people simply in virtue of their being human. Empiricism, on the other hand, is the view that these psychological structures are acquired in virtue of the peoples' experiences. The testable difference between the two is that innatism predicts that two people with similar (yet nonetheless different) experiences will acquire the identical psychological structure, whereas empiricism predicts that they will acquire similar (but different) psychological structures.

In this thesis, the psychological structure we are concerned with is the subjective lexicon -- that is, the meaning a term has for a given individual. Some linguists/-philosophers/psychologists have claimed that the acquisition of the subjective lexicon is innate; that the specific meaning relationships a term has to other terms is common to all speakers who have had similar experiences, merely because these speakers are all humans. (Examples of such theorists are Jerrold Katz, Jerry Fodor, Stanley Cavell, and Geoffrey Leech).

We develop a conception of the subjective lexicon where each term is represented by a (psychological) point, and is related to other terms by certain "dimensions of meaning." The resulting framework is rather like a net. There are, in

the literature, conceptions of the subjective lexicon which are superficially rather similar to this. We canvass componential analysis, lexical decomposition, and various psychological theories which attempt to associate certain bi-polar dimensions with all terms; in each case, there are substantial differences with the present viewpoint.

With this conception of the subjective lexicon, various methods of ascertaining the dimensions of meaning of a given group of terms are investigated, and the techniques of multi-dimensional scaling and individual scaling of differences are advocated. Using these tools, the (philosophical) subjective lexicon of a group of professional philosophers -- whose (educational) experiences are independently known -- is investigated. It is shown that in spite of similarity of experience, different philosophers have distinct subjective lexicons, and that the similarity of their lexicons is directly proportional to their (educational) experiences.

For contrast, a group of philosophically naive students is also investigated. It is shown that the differences between the philosophers and students as a whole is most naturally explained as being due to a difference in education.

It is concluded, therefore, that innatism with respect to the subjective lexicon cannot be maintained in a strict, testable form.

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CHAPTER I

INTRODUCTION

Background Remarks

Everyone who has taken some philosophy course manages to ponder the following puzzle at some early stage of his development. Is the following story possible and, if not, how do we know it's not? The subjective sensation you have when you perceive the top light in a traffic signal is not qualitatively the same as the sensation I have when I perceive the top light, but rather is qualitatively the same as the sensation I have when I perceive the bottom light. And that therefore what you call 'red' is that sensation I would call 'green' if I were to have it. Along with a million other undergraduates, I pondered this question at great length until my professor asserted that the question (as asked) was in principle unanswerable and hence meaningless. The nearest answerable question, he would say, was "Do we call the same things 'red' and 'green'? Since we do, the meaning of the term 'red' is the same for the two of us...they are "functionally invariant". If the meaning is some psychological state (concept, sensation, etc.), then we have the same sensation of red. If not, the notion of some subjective state, available to no one but yourself, is meaningless." Variants of this answer have been given to generations of undergraduates and drilled in until almost

all professional philosophers have adopted it. Yet, underneath it all, one has some feeling of unease.... Just because it is not directly observable, why should that simple fact alter the putative possibility? Just because we use a term in the same circumstances, does that guarantee sameness of subjective impression? Cannot there be some regular compensatory mechanism which is systematically at work here? Is it really meaningless to wonder about the subjective meaning of the terms one uses?

The whole issue is not restricted to sensations, it can be broadened to include all issues of meaning. For instance, our undergraduate might wonder whether he and I attach the same meaning to the term 'dog', or to 'empiricist', or to 'philosophy', or to 'beauty', or to any term whatsoever, regardless of whether the term be a technical one or an ordinary one. The instructor could give the same response: if we use it in the same way, that is the sum total of what is observable and hence of what can be meaningfully wondered about. But again, the student might have qualms about the legitimacy of this "positivistic" answer. Cannot we attach different meanings to the term but these differences never show up (or never be noticed) in our overt linguistic behaviour?

Let us distinguish two kinds of answer to our naive undergraduate's question. First a "privatist" answer: It is possible that we attach different concepts, ideas, connotations, or meanings to these terms, but because they

are private unto the speaker, no one else can ever find out. Second the "positivistic": Since by hypothesis we can never find out, it is meaningless to ask the question -- it is a "category error" of the same magnitude as wondering whether quadruplicity drinks procrastination.

I think both answers incorrect because I think that we can find out whether we attach different concepts, ideas, connotations, meanings, or whatever, to the terms. One of the things that is needed from me, obviously, is some adequate theoretical account which will show why this is possible. So I will first turn to an account of the general framework in which I have worked. As we will see, this framework is not too idiosyncratic -- it has been adopted by many theorists in many different fields as an account of the subjective meaning of a term for an individual. It is a kind of framework which can engender "privacy" in a natural way, for many of the theorists working within this framework have developed a model for communication and language learning according to which the supposed privacy of subjective meaning entails that (perfectly) successful communication is exceedingly rare, and according to which if it does occur we can never know it. This view I shall call "strict privatism". Other theorists, still working within this framework of the subjective lexicon, are repelled by the conclusion of strict privatism, and therefore have altered the portion of the model having to do with language learning. This alteration makes it be the case that,

because different people are all endowed with similar neural (mental?) equipment, they all have the identical subjective meanings for (at least) ordinary terms. This view I call "innatism" -- it allows the possibility of strict privatism but says it is empirically false.

Still working within the same framework as the strict privatists and the innatists, I take a different view of what successful communication is and thereby leave the "privatist-innatist" controversy open. That is, I point out that both the innatist and strict privatist have in common a certain view of what successful communication is and then differ on whether they think innatism or privatism is the lesser of the two evils that they are faced with. For the position I take about communication, there will be no general, theoretical reason to adopt either innatism or privatism.¹

What I want to do is ask the question: is innatism (with respect to subjective meaning of words) true? The neutral position I find myself in with respect to innatism and privatism seems to me to afford a good starting point to investigate the question. It is widely believed that innatism -- or at least innatism with respect to psych-

¹ Recall the arguments used by the privatist and innatist. (1) "From the concept of communication and facts about language learning, privacy is inevitable", (2) "From the concept of communication and the fact that privacy is absurd, language learning must involve innate structures and dispositions."

ological structures -- is not an empirical hypothesis. It is more a matter of "taste", or of how one wants to look at the world.¹ The reason is that innatism can be made to blend into its competitor theory (which I will call "empiricism" -- the view that all facts about what one learns can be accounted for solely in terms of the learning experiences one has). Probably no innatist has held that babies are born with fully formed concepts. Rather, the classic innatists like Plato and Leibniz held that experience moulded the mind to produce certain psychological structures that the individual was predisposed to have. So in both innatism and empiricism it is experience that is the driving force behind learning. They differ over the kinds of predispositions they allege to exist. It was claimed that what distinguished their innatism from empiricism was (a) that certain concepts could not be produced no matter what the experience, and (b) that a wide range of experiences would produce the identical concepts. Leibniz's famous example of veined marble is particularly suggestive here: no matter what experiences chisel at the marble, the veins cannot become invisible (=some concepts cannot be produced); and there are many different ways for experience to chisel at the marble to form the same object, since the

¹ Innatism with respect to physical structures is, of course, true. People are endowed with certain physical characteristics merely in virtue of being human, but even these develop and are influenced in that development by an environment and experiences in that environment.

veins will make the marble tend to chip off in the same way even with different chiselings. This view I shall call "strict innatism" and I think it is different from empiricism. But strictness can become mushiness, and innate theorists might start to restrict the class of experiences which are claimed to be able to chisel the marble in the same way. That is, they might be tempted to go to the extreme that only identical experiences can produce identical concepts. Under this mushy innatism, the veins of the marble play no role; the theory is in all observable ways the same as empiricism. Here the difference is merely a matter of "taste". Another way innatism can be made mushy is to claim that different people are innately disposed to have, or pay attention to, different experiences. So that, although two people might both have the innate concept (i.e., the relevant vein in their marble) of a necessary being (to pick a famous example), and they might have the identical experiences (when viewed from the outside), the one might actually acquire the concept of a necessary being and the other not, because the one has some other vein which dictates that he not attend to this experience. And this kind of mushiness leads to another, wherein different people have different innate ideas (viz., those corresponding to the concepts they actually acquire).

I think that none of these mushy forms of innatism have any observable differences with empiricism, and that their

adoption is a matter of (bad) "taste".¹ Strict innatism does have observable differences with Empiricism, however, and it is that form I wish to inquire into the truth of.

So, how would one decide between strict innatism and empiricism? Well -- their difference is in what they say happens to people with similar but non-identical experiences. So we need some way to identify people with similar but non-identical experiences, and some way to find out whether they have identical or different concepts relevant to that experience. As I said at the beginning, I am interested in people's subjective lexicon -- the concepts and connotations, etc., they attach to words. I think I can lay out a theory of this subjective lexicon and give a method by which one can determine whether the concepts and connotations (or whatever) corresponding to a given term in two subjective lexicons are the same. One thing I think I ought to make clear, though, is that I am aware that my conclusions ultimately rest upon acceptance of my conception of a subjective lexicon. They are therefore directed towards all those theorists who adopt this view of subjective meaning. So if, for example, an innatist or privatist is unhappy with my conclusions, he could deny that my conception of a subjective lexicon is correct. In my

¹ One might note that there are some pretty mushy forms of empiricism also -- having to do with how different experiences can be, and still give rise to identical concepts. I wish to consider "strict empiricism" in this regard.

defense I would then say that the conception I use is the same as that of some innatists and some privatists (most, in fact) -- namely all those who have been explicit. Others are challenged to give an alternative account.

Let us therefore turn to my account of the subjective lexicon.

The Subjective Lexicon

In the folklore from many different areas of personal advice and in the annals of academic wisdom of many different fields, one can find this anecdote:

Three blind men were set the task of determining what entity was placed before them. The first blind man grasped ahold of a long, thin, pliable object which moved of its own accord. "It's a snake," he decided. The second blind man wrapped his arms around a very large, unmovable object. "It's a tree," he smugly affirmed to himself. The third blind man was in the meanwhile patting a large, flat, pliable object. "Beyond a doubt," he confidently decided, "it's a palm leaf." The three blind men argued about the true identity of the mysterious object until the elephant trampled them to death. You see, the first blind man had grasped the elephant's trunk, the second its leg, and the third its ear.

The morals drawn from this story vary from area to area. I intend to draw this one: One cannot understand the part without first understanding the whole. In the area of the present study, namely the area of subjective meaning of terms, this moral becomes: One does not fully understand the meaning of a term (word, morpheme) unless one has a firm

grasp on the whole complex network of which that term is a part. One can perhaps have a partial understanding -- particularly when the term names some entity (e.g., the term 'Cleopatra's needle') or denotes a well-known group of physical objects (e.g., 'dog'), but the more the term has no immediate physical correlate, the more its meaning must be understood solely in terms of the position it holds in (what shall be called) its immediate semantic network. More on this concept will be given below, but perhaps this much is suggestive.

One preliminary thing should be made clear. The present thesis does not attempt to define or characterize or elucidate the concept of meaning. The account to be given below of "semantic network" is not inconsistent with any of those theories of semantics and meaning which view as primary any of the following: (a) a relation between a word and a "thing" (object, set, idea), (b) a relation between a sentence and a communicative intention, (c) a relation between a sentence and a stimulus (or a response), (d) a relation between a sentence and its truth conditions, or (e) a relation between a sentence and a disposition to behave. Instead it is the concept of the subjective lexicon which is being here characterized. In this thesis, no view is taken as to whether the characterization of this psychological structure is to be seen as basic in an account or description of the semantics of language, or whether it is to be somehow "defined," "reduced," or explained by recourse to,

say, an interaction between (b) and (e) of the above.

As I mentioned above, I view an individual's subjective lexicon as a complicated system or network of related structures. By a structure, I have in mind something like this. The meaning of a given word or morpheme is located at an arbitrary (psychological) point. Some other words or morphemes are located fairly closely -- the closer the two words or morphemes are located, the more similar the individual perceives their meanings. Of course, "similarity of meaning" is not a simple concept; it is to be expected that word A can be more similar in meaning to word C than B is with respect to property P, but B might be more similar in meaning to C than A is with respect to property Q. So, to characterize this (psychological) distance which represents similarity of meaning, it is conceivable that we need to account for an arbitrarily large number of possible properties along which words might differ in meaning. We shall call these properties "dimensions of meaning."

Given a group of n terms, there need be no more than $(n-1)$ dimensions of meaning to characterize the total distances amongst terms. (And that would be the case when each pair of terms differs from each other pair along a unique or orthogonal dimension). Of course, it is not to be expected that this maximal characterizing number of dimensions of meaning will be required, since it is expected that speakers will (at least in part) compute the distance between A and B as a function of the distances that they

each have to C. If they always do this, then the number of dimensions of meaning required to completely characterize the distances will be less than $(n-1)$.

It is to be expected that, given a group of terms which they perceive as similar, speakers will have some fairly small number of dimensions of meaning along which they evaluate the similarity (or difference) of all the terms. This last holds for a group of terms that speakers think of as belonging to the same "field," that is, terms which are seen as (in some way) belonging together. In such a case, we shall say that the terms belong to the same "semantic domain" or "semantic field." It is also to be expected that psychological structures defined by two distinct semantic domains may be related by some dimension(s) of meaning, but it will either be that (a) the relationship is along one of the dimensions used in one of the structures and the dimension measures the distance between the two structures as very great compared to within-structure measurements, or (b) the relationship is to be measured along a dimension which plays no role in measuring the distances internal to each of the structures. Put spatially, each structure will be tightly knit, but the two structures are only loosely connected to one another. Considered together, the two structures form a superstructure or portion of a semantic network; the total semantic network is one's subjective lexicon.

Under this conception, the (psychological) meaning for

a person will be a complex consisting of what the person thinks the term denotes together with a specification of its position in his subjective lexicon.¹ It should be noted, since the issue will arise again, that the meaning of a term for some arbitrary person can be independent of its meaning for any other person or its "meaning in language as a whole," except insofar as these latter may help condition the term's position in this person's subjective lexicon.

The theoretical position taken in this thesis is superficially similar to various approaches taken in modern linguistics. In Katz & Fodor (1963), and as adopted by Chomsky (1965), Katz (1966, 1972), Bierwisch (1969, 1971), among others, the lexicon is represented as containing various parts. One of these parts is a set of features which represent, inter alia, the "concepts" which are "parts of a meaning" of a lexical item. These writers argue that the lexicon of a linguistic theory must contain these features (and other things also), in order to adequately account for both semantic phenomena and syntactic phenomena. A lot has been written by philosophers in criticism of this conception of semantics (see Vermazen 1967, Lewis 1972,

¹ A possibly circular way to characterize this notion. If one antecedently understands the above analogies, the present paragraph should be taken as characterizing 'meaning for'; if one antecedently understands (psychological) 'meaning for', this should be taken as a further explanation of the above analogy. Note, once again, that this is not a characterization of linguistic meaning. It is a characterization of 'meaning for' (or 'significance to') a person.

Pelletier 1977), but in linguistics it has been universally adopted (sometimes with minor alterations). One kind of alteration is given by Weinreich (1966) who argues about the precise formulation of these features and how they are to be combined when producing the meaning of longer phrases containing the words. Another kind of alteration is to claim that the lexicon does not contain morphemes plus features associated with them, but rather only the features (or "semantic primes", as they are then called), which are later "lexicalized". (That is, at some point in the (transformational) derivation of a sentence, the co-occurrence of these features triggers some grammatical rule which alters the features into a morpheme). This is the view first given (I think) by Gruber (1965), followed by generative semanticists, and studied under the title of 'lexical decomposition'. See Zwicky (1976) for a summary and bibliography.

One fairly obvious theoretical problem with this general approach is that it seems to commit one to a "universal semantics." That is, it requires that the set of features or semantic primes be a "fixed, universal vocabulary" (Chomsky 1965, p.160; see also McCawley 1968b) which holds for all speakers of all languages. A consequence of this is that it requires the theory to account for why not all words in all languages are directly inter-translatable, i.e., why not every (logically) possible combination of features corresponds to a word in each language. To explain this can be seen as one part of the goal of the account of "exceptions"

given in Lakoff (1965). One might attempt to avoid this difficulty by denying a "universal semantics" of this sort, either along the lines taken by Whorf (1946) or along the lines taken by practitioners of "componential analysis". (A summary of componential analysis and thorough bibliography is given by Nida, 1974; see also Wallace, 1965).

According to these latter kinds of writers, there is no "universal semantics," at least not in the sense that every feature in any language is taken from some fixed vocabulary. Rather, it is envisaged that each language has its own stock of features, and that these features may only occasionally be identical to those of another language. It would seem to follow from this view that people from distinct linguistic cultures can never "truly understand one another"; and indeed, this is precisely the conclusion reached by Whorf (1946). There are a variety of difficulties associated with a strong form of this theoretical position; but this is not the place to go into them. (For discussion and bibliography see, for example, Penn (1972) and Cooper (1973).) Most componential analysts do not seem to be aware of this apparent consequence of their position, and seem to believe that the semantic network determined by a group of terms in one language as defined by the relevant semantic features of that language can be explained or approximated in another language by indicating features of this other language which, if adopted, might lead its speakers to use their terms in the same way as the corresponding terms are used in

the language under study. Consider the following example: The semantic network determined by the kinship terms of Choctaw as defined by the relevant semantic features of Choctaw are viewed as explained or approximated in English when features of English are assigned to the English kinship terms in such a way that, if adopted, English speakers would use the English kinship terms in the same way that Choctaw speakers use their kinship terms.

When the methodology of componential analysis is stated this way, its conceptual inadequacies become transparently obvious. For one thing, even if one could have adequate evidence for each of the other steps in the above example, it still would not follow that the analyst could be justified in asserting that the features of Choctaw kinship terms were in fact the ones he uses to approximate hypothetical usage in English. For, after all, it was postulated at the outset that the set of features in the two languages need not be the same; indeed, the whole theoretical rationale of componential analysis makes it impossible to ever get adequate evidence to settle the issue, since we cannot get "outside language." (For a summary of similar criticism, see Burling (1964); some of these issues are taken up in Wallace (1965).) I wish here to point to another unpleasant theoretical consequence of componential analysis, and then to a dilemma which faces any theory of word meaning, including the present study, which views these meanings as composed of "features" or "primes."

It seems to have gone unnoticed by componential analysts that, for the very same reasons one might want to deny the necessary existence of a "universal set of features," one ought to deny the necessary existence of an interpersonal set of features common to a given language. After all, if one holds to the view that an individual acquires concepts (including these features) through experience, one should recognize the possibility (if not likelihood) that individual learning experiences will differ and lead individuals to (a) have subtly different features in their subjective lexicon, and (b) associate features with words in subtly different ways. If now, we add one more seemingly plausible assumption, namely that communication takes place when the relevant portion of the speaker's semantic network is replicated by the hearer (an assumption that componential analysts seem to find agreeable, see Nida, 1975, Chap. 1), we are led to the radical conclusion that our theory decrees that we are never in a position to have adequate justification for the hypothesis that individual speakers of even the same language ever communicate. That is, the Whorfian claim can, according to their theory, be made for idiolects as well as for different languages. This is an intuitively unacceptable consequence and, if we wish to embrace some theory like componential analysis, we must find some way to prevent this conclusion from being entailed.

Finally here, let me state a major methodological

difference between the present study and these more purely linguistic theories of Katz, Bierwisch, the generative semanticists, and the componential analysts. The methodology pursued by these writers is introspective in nature; that is, to discover what features a word (in one's own language) has, one consults one's own network. To discover what features a word in another language has, one goes through the procedure outlined above in the Choctaw example. But even this last ultimately rests on introspection, for the final test is the hypothetical "if adopted, would these features lead English speakers to use English kinship terms in the same way that Choctaw speakers use Choctaw kinship terms?" And that question is resolved by the investigator consulting his own intuitions. When, one might ask, would such a procedure be acceptable? One case would be (for the same-language case) if all speakers had identical networks for their lexicon. Broadening this, the different-language case would require that there be a "universal semantics." However, we indicated above that it seemed a plausible assumption (1) that one learns one's concepts (features) and their relationships solely from experience, and (2) that different people have qualitatively different experiences which are relevant to this learning. One can deny this assumption. In fact many transformational linguists seemingly do deny (1) and claim that linguistically relevant

concepts are innate.¹ Following the reasoning given by Locke (1690, Bk. I), we should not accept this as an explanation unless we have shown that all other possible explanations are false. That is, due to its untestability in a direct manner, it is to be accepted only after all directly testable explanations have been shown inadequate. One might instead deny (2) and claim that, so far as linguistically relevant experience goes, it is qualitatively the same for us all (and that individual biological differences are irrelevant to language learning). This would seem to be a somewhat more difficult position to maintain, in that it makes the claim that the issue is empirical in nature (by denying the untestable innateness claim) while on the other hand it seems to be falsified by our ordinary experience.

Nonetheless, one or the other denial seems to be required by the methodology of all these theorists who think that they can get empirical truth about the lexicon by introspection. The dilemma which faces all theorists who view word meaning as being somehow explicable in terms of semantic features or primes is this: Either (a) It is possible that different speakers have different semantic

¹ Generally, this claim is made for syntax and not explicitly for word-meaning. Exceptions are Leech (1974), Fodor (1977), and Katz (1966, 1972) who do make it for word meaning. However, it seems that the identical reasoning would hold for both syntax and word meaning, so that if it is viewed as valid in the case of syntax it should be viewed as valid in the case of lexical semantics also.

networks and the proper methodology for investigating the lexicon is to devise an empirical test to determine the differences, or else (b) Every speaker's language-learning-relevant experience is identical and there is some (language-independent) empirical method of discovering this, or (c) There is a "universal semantics" in the sense that there is a "fixed set of features common to all languages" and each speaker is innately determined to acquire that semantics.

The major methodological assumption of this thesis is that (a) of this dilemma is correct. The goal is to find a suitable empirical test; and a condition on the adequacy is that there be an explanation of how some people can sometimes communicate. In this assumption and goal we are at one with Anglin (1970) and Fillenbaum & Rapoport (1971).

Given the preceding theoretical framework, and the assumption that a person A understands a person B's use of a term t only if the meaning of t for A is the same as the meaning of t for B, it ought to strike everyone as incredibly surprising that anyone ever understands anyone else. For, that would require that this incredibly complicated system of interrelated networks is the same for us all. In fact, many linguists, philosophers, and anthropologists have taken precisely this position (although sometimes for different reasons).

The usual way the argument for this position runs is this: (1) Everyone admits that (even within one's own

idiolect, and surely within "language as a whole") words are ambiguous, have different shades of meaning-relationships with other words, etc. (2) Because of our varied backgrounds, it would be an impossible coincidence if we all had exactly the same shades of meaning-relationships in mind whenever we used a given word -- even a fairly technical word. Therefore, communication does not even ordinarily succeed. Not only is there sometimes "lack of communication" and "misunderstanding" in spite of sincerity of intention, but this is by far the normal state of affairs.

Locke (1690, Book III) seems historically to be the first to suggest this; Russell (1940) also sometimes believes it; and generally, it is a phenomenon to be expected by most "empiricists", e.g., recent psychologists. In more recent times we can find the doctrine more or less explicitly stated by Whorf (1946), but primarily there for different "cultures" and only secondarily for different individuals. It is an explicit doctrine of the "general semanticists" -- Korzybski (1933), Hayakawa (1954, 1964); it sometimes is hinted at by the "empirical semanticists" -- Naess (1953), Tennesson (1974) -- but is apparently not a part of their "official doctrine" (Tennesson, personal communication); it is stated clearly by some scholars of Eastern religions (Watts, 1957, Chap. 1). It is also a doctrine which is to be expected to surface in those philosophers of the "historical/causal" explication of meaning, such as Donnellan (1974, 1977), Kripke (1972,

1977), Putnam (1976), Linsky (1975), and Ackerman (1976, 1977) -- although only Ackerman is explicit about this point. The general idea behind the "historical/causal" theory is that every person will have the meaning of certain terms¹ given to him by some experience (normally, some specific childhood experience). This experience is causally related to the (childhood) experience of the teacher in his learning of the term, which is causally related to that of the teacher's teacher, and so on back to the original introduction of the term into the language by some act of "baptism". This account is alleged, by these philosophers, to be able to account for a variety of linguistic facts -- as, for example, how it might be that a term like 'gold' could be introduced into our language by some definition which includes a feature like "+yellow metal" and yet we can continue to use the term even though some of the stuff we apply it to is not yellow. The extreme "privacy of meaning" entailed by this position is not remarked upon, except by Ackerman who finds it an "interesting consequence" but not one which shows the falsity of the general position. Among modern psycholinguists, it can be found in Brown (1958, p. 375), Vygotsky (1934, pp. 205-208), and Miller (1973a). The doctrine is very widespread among sociologists, sociol-

¹ A different class of terms for the different philosophers, presumably, but they all agree on this account for proper names and natural kind terms (such as 'water', 'tiger', 'unicorn', etc.)

inguists (Kolers, 1973), anthropological linguists, anthropologists (Wallace, 1970), and social psychologists. I shall quote here at length from Wallace (1970) in order to give the reader a feel for an extreme form of the position and to allow him to make his own connections of this position to his own field.

A given symbol, of course, need not have the same meaning for all; the meaning, indeed, resides in the perceiver rather than in the symbol itself. Thus the meaning of a symbol may...differ from person to person... (p. 93)

It would be difficult to find any single cognitive structure that is uniformly shared by all members of any community. (p. 110)

It may appear to be a bleak prospect to consider that human beings characteristically engage in a kind of silent trade with all their fellow men, rarely or never actually achieving cognitive communality. (p. 33)

The unwanted inevitability is not sin, nor conflict, but loneliness: the only partly bridgeable chasms of mutual ignorance between whole peoples and the failures of understanding between individuals. (p. 24)

The general position taken by these thinkers is essentially that of de Saussure's followers, the "structuralists," although only some of them make the leap to non-mutual-understanding, e.g., Levi-Strauss (1963). All the assumptions are heartily endorsed by Lyons (1968, pp. 402-412), but he explicitly rejects this obvious conclusion (for no obvious reason: see fn. 9.2.9, p. 488); they are also endorsed by Leech (1974, Chap. 3) and Fodor (1977) who also

reject the conclusion (but for a reason -- they are "innatists" and hence deny that it is an "impossible coincidence" that everyone has the same network).

One despairs at the picture presented by such thinkers. "Pop culture" tells us that there is sometimes "failure to communicate" in spite of sincere attempts on both sides; but the present outlook would have us believe that we always "fail to communicate." International misunderstandings we (hope we) can live with, but the idea that we do not "really" understand even our best friends ever, is depressing. The theoretical position presented by the given line of reasoning is clearly at odds with what we take to be social fact -- that language is an instrument we use for communication.

Is there any way to find out? Of course, merely pointing to the supposed fact that people talk with one another, or that they appear to learn, is not sufficient; for our present theorists tell us that this is all illusion. What is needed is some complex task which will give us an independent measure of the presumed network, so that we can see if different people's networks are alike. I believe that the multi-dimensional scaling analysis (MDS, to be described below) does this. As a further side-benefit, the particular tests carried out in the present study can inform us of the effects of "education" on one's subjective lexicon.

There are two groups in the present study: (a) a group

of professional philosophers, and (b) a group of university students with no philosophical training. This study uses two groups of terms (or "semantic domains") common in philosophy: for the purposes of this report (and also to indicate the specific area of philosophy in which each domain is commonly employed) the domains are called 'action terms' and 'science terms'.¹ With respect to group (a), the use of these terms should make the variability of networks less susceptible to variation because of educational backgrounds and insure that the subjects have given some reflective thought to the meaning-relationships among the terms, since these are professionals dealing with a group of more-or-less technical terms in their discipline.² The use of such terms ought to at least partly ameliorate the charge of Ullman (1962, p. 249), who points out:

That the neatness with which words delimit each other and build up a kind of mosaic, without any gaps or overlaps, has been greatly exaggerated. This is true only of

¹ From now on it is to be understood that a "semantic domain" is set of terms, words, phrases, etc., and not any "reality" one might wish to correlate with it (such as a psychological framework, or a "conceptual framework", or a description of "the world corresponding to the terms", etc.). We shall appropriate the phrases 'semantic network', 'semantic structure', or 'semantic framework' to denote the supposed subjective psychological reality which we are attempting to describe in this thesis. That is, the individual's perception of the semantic domain is his semantic network for those terms.

² While it is true that one would expect the least variation among such people on these terms, even so, some thinkers believe that the general problem will still arise, perhaps in an even more insidious manner. Vide Tennesson (1974).

specialized and rigidly defined systems such as army ranks; in ordinary language, vagueness, synonymy, ambiguity, and similar factors will produce a much less tidy picture.

It is not envisaged that even professional philosophers who have carefully thought about their meanings can use "technical" terms in a rigid manner. After all, the terms are borrowed from ordinary discourse and will still have vestiges of the original fuzziness about them; furthermore, even in technical discourse (except perhaps with respect to army ranks) terms are "extended" in meaning in various ways. Part of being a useful term is being usable in novel circumstances in such a way as to capture a part of the new circumstance, and bring the rest of the circumstance under the general purview of the term used.

Finally, consider once again the concept of a semantic network. Any "semantic domain", and therefore any member of it, can be viewed as being characterized by different "dimensions of meaning." As a simple example, consider a set of phrases of the form "colour word + shape word", so that we have black circle, red square, etc. Rather obviously, there are two prominent dimensions of meaning in these phrases: a colour dimension, and a shape dimension. A group of temperature terms might be expected to have one dimension of meaning: degree of heat. Similarly, a group of kinship terms might be expected to have at least two dimensions of meaning: a (geneological) nearness one, and a sex one. But these are only the obvious dimensions. It is envisioned

that, say, in a group of emotion terms, various (perhaps unexpected) dimensions could be used: a pleasant/unpleasant dimension, an active/passive dimension, a rejection/attraction dimension, etc. And of course, it is also likely that some of these dimensions are much stronger than others; further, different people may have different dimensions, or different strengths of the dimensions appearing.

If, now, a term is applied in a novel situation, it could be because one of its dimensions of meaning applies well, but its other dimensions may apply only because of a drastic attempt at forcing. Sometimes this forcing results in new insights and even genuine conceptual breakthroughs, as for example Einstein's use of simultaneity (of events) or Freud's use of motive (as applied to the unconscious).

What of the original problem: how is it that people can ever communicate, given that it is essentially a problem of coding (a portion of) one's semantic network and that no two semantic networks are the same? I view the problem to be essentially this. The following four propositions lead to the unacceptable conclusion that we never communicate with one another: (1) Our subjective lexicon is a semantic network, (2) This semantic network is acquired solely through experience, (3) No two people have precisely the same experiences, (4) True communication consists in coding a portion of one's subjective lexicon and having it uncoded into precisely the same network. From (1), (2), and (3) it follows that no two people have the same semantic networks,

which, together with (4), yield the conclusion that even with sincere intent no one ever understands anyone else. Since this conclusion is absolutely unacceptable, there must be some false premise among these four. (1) and (3), at least for the present thesis, are not controversial, and so we shall not worry ourselves about them.

It is popular in modern linguistics to say things which imply a denial of (2) -- as mentioned above in the cases of Leech (1974), Fodor (1977), and Katz (1966, 1972). It is popular to resort to the notion of "innatism" in various areas of linguistics, and here it could be pressed into service as a way to deny (2). If (2) were denied then it should not be surprising that we all have the same network, since this similarity would be attributed to the "innate component."¹ Now, many people think this a "non-explanation" -- and rightly so, as it is often used. However, it may be put in such a way that there is some predictive value in it.

Notice that the intermediate conclusion that it is not the case that people have the same semantic networks, is due entirely to premisses (1), (2), and (3). Given, as we are, the truth of (1) and (3), if we can show that the intermediate conclusion is true, we will have evidence to justify premise (2). Granted, it is not conclusive, but it is hard to see what other empirical predictions could be relevant.

¹ Of course, it would then be difficult to explain how people can ever misunderstand one another.

As we shall see in the chapters to come, this intermediate conclusion is supported, and hence we have good grounds for belief in premise (2). Now, since we cannot believe the conclusion, we must deny the only remaining premise, premise (4). It shall be the hypothesis of this thesis that if two people's semantic networks are "close enough" there can be genuine communication.

I do not wish this to be taken as a truism: I intend to show that there are large, definable groups of people, each group having essentially the same networks (as judged by MDS), and within these groups communication can carry on normally. More generally, we shall show that people who have more-or-less the same educational background in a rather specific area of word-meaning will form one of these groups. We also shall show that when tested in an area in which these same people have distinct backgrounds, they will not fall into the same groups. We take this to show that it is similarity of (learning) experience which determines the groups and not some "innate structure" -- not even "innate structures which are evoked by experience".

Of course, a mushy-minded innatist could deny that such results prove the "pure experience hypothesis". He could, for example, take a strong stance on the "innate structures which are evoked by experience", so that this is indistinguishable from the "pure experience hypothesis". Or he might claim that it is somehow innately determined which people will be the ones to attain certain kinds of

education. But these contortions are merely evasions: if innatism with respect to word meaning is to have any empirical content at all, these sorts of moves simply are not available. "Failures of communication" are therefore predicted to occur between people in different groups. And these "failures" can be documented on independent grounds -- they are not merely vacuous predictions. People within a group are to be thought of as "truly communicating" with one another; and the degree to which people between groups "fail to communicate" is a function of how unlike their semantic networks are -- that is, as a function of how dissimilar the meaning of a term they wish to use is for them.

Semantic Networks and Communication

Up to this point the discussion has focussed upon the subjective lexicon, i.e., upon the semantic network possessed by a person, and it was claimed that a certain view of this matter entailed that different people might have different semantic networks and hence not "truly understand" one another when attempting to communicate. That is, it was claimed to be an effect of differing semantic networks that communication fails. This naturally raises the question of in what does communication consist. I think this topic is extremely difficult and cannot be answered simply; I therefore will offer some sketchy remarks discussing communication and how it interacts with the semantic network. Once we see the role of the semantic

network, we can perhaps see the relevance of the possibility of differing semantic networks on the claim of non-understanding; and this will provide a rationale for our focus upon the semantic network in this thesis. The account here of communication will follow Grice (1957, 1968, 1969), with the modifications of Lewis (1969), Schiffer (1972), Strawson (1964), and Bennett (1973, 1976) -- although these writers have somewhat different goals than I.

We are interested in linguistic communication. Therefore, we should consider "thought experiments" about speaker/hearer situations; situations wherein the speaker is "trying to get something across" to the hearer, if we are to try to discover what will count as communication. This means that we will be concerned with the speaker's intentions. One way of putting this is "words and sentences do not have meaning in and of themselves; what is important in the study is the meaning a speaker invests his utterances with." As noted before, a problem with this approach is that intentions are (in some ways) "private" to the speaker -- so how is a hearer to discover them? Yet in successful communication, the hearer does discover them. This yields an adequacy condition on any proposed analysis of a speaker/hearer situation: if the analysis claims that communication is possible, the analysis must be such that when a speaker utters something all his intentions which govern the "meaning" of his utterance must be "out in the open." There can be no possibility of "hidden intentions",

ones that are in principle not available to the hearer.

This section is also about linguistic communication, and not just about communication that happens (in some way) to involve language. Not all communication that involves language is linguistic; for example, if I want to communicate to you that I dislike you, and I do so by shouting words in your ear so loudly that they break your eardrums, you would naturally take my action to be insulting -- not because of my words (even if they too were insulting), but because I broke your eardrum. Or I could communicate to you that my memory was superb by repeating a list of English words -- but that is not linguistic, even though I used language in doing my communicating. Thus, we need something in the account about the "conventional" meaning of utterances in a natural language.

The relevant sense of a speaker's (S) performing an act of linguistic communication to an audience (A) is given by a certain set of conditions that are to be fulfilled. I shall use p to indicate the "message" that S has in mind and wishes to communicate to A; I shall use x to indicate the actual form of the utterance which S makes. I shall not go into all the reasons for each of the conditions given, the reader is referred to the authors listed above, especially Schiffer (1972).

Now, x has a "conventional" meaning in the language-community of which S and A are members; but in order to communicate properly, S needn't have that conventional

meaning in mind. What he needs is rather that A know the relationship between x and p that S has in mind. Usually, of course, the relationship is that the conventional meaning of x is straightforwardly p, but it needn't be. Consider two relative strangers: S says 'I wouldn't mind going to the pub.' A should expect that S's intended message was "I have no objections to going to the pub." But given two close friends, A might very well expect that S's internal message was "I very much desire to go to the pub." Why should A believe this? Well, S almost always utters those words with that message in mind; A knows this (from previous experience); S knows that A has such knowledge (and therefore feels free to say those words to A with that intended message); A knows that S knows that A knows this (and therefore knows that S very likely will try to get that message across with those words to A); etc. I shall call the type of knowledge: A knows that X, S knows that X, A knows that S knows that X, S knows that A knows that X, A knows that S knows that A knows that X,... etc., mutual knowledge of X.

Now, S will utter x with the intention of bringing about a certain state of affairs (which he will want to become known to A). Let's call this state of affairs E. Typically, E will involve the fact that S, a person with certain properties (e.g., being a speaker of such-and-such a language, who is in so-and-so a social group, etc.) has uttered a token of type X which has certain features (e.g.,

voice inflection, loudness, conformity to a certain grammar, a certain degree of (surface) complexity, etc.) in the presence of A who has certain properties (e.g., is attentive, has bad hearing, is a speaker of S's language, is in so-and-so a position with respect to S, etc.) in certain circumstances (e.g., background noise, social situation of S and A, etc.).

In order to make S's bringing about E (and intending to do so) into a real case of linguistic communication, we have to say some more about S's intentions. First, something about what E is like: S must know that he has actually brought E about, and he must intend that the bringing about of E become known to A. He must know that A knows that S knows that he has brought about E, ... etc. That is, S must know that S and A mutually know that E obtains. Secondly, we must insure that the obtaining of E be the reason that A has for whatever beliefs he has concerning S's utterance of x (and not some other reasons for these beliefs). Thirdly, E must be good evidence that S uttered x with the intention to bring about E (and not indicate that E was (say) accidental). And finally, concerning the particular beliefs that A must form in order for there to be linguistic communication:

- (1) S's utterance of x must cause in A the (activated) belief that p.
- (2) There must be some truth-supporting reason(s) R such that S must intend A to have R for the belief that p.

- (3) The satisfaction of (1) and (2) must be achieved (at least in part) by virtue of A's belief that x is related in a certain "natural" way to the belief that p.¹

Thus we can arrive at a set of conditions which are necessary for a real act of linguistic communication to occur.

X is an act of linguistic communication that p by S's uttering x only if

- (1) S uttered x intending thereby to bring about a certain state of affairs E
- (2) E is intended by S to be such that the obtaining of E is sufficient grounds for S and A to mutually know that E obtains
- (3) E is intended by S to be such that it is mutual knowledge that E's obtaining is good evidence that S uttered x intending
 - (a) that S's utterance of x cause in A the activated belief that p
 - (b) that there be some truth-supporting reason(s) R such that S intends A to have R for the belief that p

¹ Truth-supporting as opposed to prudential, moral, etc., reasons for (2). This is (a) to capture the demand that communication be rational in a certain sense, and (b) to reflect the fact that communication, in general, aims at the production of knowledge and not just belief. (3) is a difficult condition. For a reasonably clear discussion of it, see Schiffer (1972) pp. 52-53.

(c) that (a) and (b) be achieved at least in part by virtue of A's belief that x is related in a "natural" way to the belief that p

Have we now captured the two aspects of linguistic communication mentioned at the outset? I think so. Obviously we have captured the fact that it is the intentions of the speaker which are relevant to an act of communication. But also the fact of language is captured. It is not merely that the speaker has a bunch of intentions about what he wants to "get across" -- he also has to have an intention to communicate these intentions. How can he do this? Well, if they are using semaphore signals, S must know them, A must know them, S must know that A knows them, A must know that S knows them (and not just be waving flags randomly), S must know that A knows this (that S knows them), etc. That is, they must mutually know the semaphore system. If the signals are in a natural language, S and A must mutually know it and also its conventions. Of course, that is not enough -- there must be some restraints on the exact way S's utterance of x actually brings about A's belief. It is here that one should be directed by the philosopher's "thought experiments", for they answer the question "Just what restraints are necessary?" The restraints we have just mentioned were determined by asking such hypothetical questions as "If the facts about S and A's beliefs were so-and-so, and if the facts about E were such-and-such, would that be a case of linguistic communication?"

After a study of a large number of such hypothetical cases, the set of conditions was constructed. I have not here gone into a detailed exposition of such cases, the interested reader is directed especially to Schiffer (1972) and Grice (1969).

It is to be noted where the semantic network of the speaker enters into this process: it is (a) at the beginning of the process when he forms his original intention, and (b) at any stage where he makes a correction to alter the E he caused. Now, since we have given an account of linguistic communication in terms of intentions, it follows that some non-linguistic account must be given for intentions. For, if not, we are not only open to the charge of circularity, but the speaker himself would be in an impossible position -- in order to communicate (to anyone), he has to communicate (with himself), and to do the latter he has to communicate (with himself) It follows that whatever the proper representation of a semantic network may be, the actual psychological process cannot be linguistic. (For arguments to the contrary, see Fodor 1977). Our representation of the network in terms of dimensions of meaning mirrors this. For ease of description, we may refer to one dimension as, e.g., "degree of necessitation", but the reality being so described is psychological, not

linguistic.¹

Methodological Remarks

There have been a number of studies of the structures of various semantic domains. Anthropologists have investigated the domains of pronouns and kinship terms (Hammel, 1965; Romney and D'Andrade, 1964; Wallace and Atkins, 1960). But these kinds of studies have all been within the framework of componential analysis, with the kind of inadequate methodology mentioned above. This is the case even in those works that are avowedly concerned with "psychological reality" as Wallace (1965). Osgood and his associates (see Osgood, et al., 1957) have used antonymous rating scales to obtain "similarity of meaning" data, and also have investigated "semantic interaction" in an attempt to discover (or characterize?) possible vs. anomalous word combinations. Deese (1965), Clark (1968), Henley (1969), Henley, et al. (1968) have used association techniques to "map out" (association) relationships that hold for some given term. Miller (1967) has argued for the use of hierarchical clustering techniques in analyzing these sorts of data. But more closely related to the present approach is that of Fillenbaum and Rapoport (1971).

The present report rejects the approach of Deese and

¹ Similarly, we may describe gravitation as "mutual attraction of mass", but that is not what gravity is -- for gravity is not linguistic at all.

associates on two grounds. First, I desire to maintain a fixed semantic domain and discover the relationships that hold among the terms within that domain. Deese's method is open-ended in the sense that the subjects are allowed to "freely associate" any term and then a "mapping" is made of the "kinds" of associations performed (subordinate, coordinate, location, etc.). Secondly, and even more fundamentally, association techniques do not in any straightforward sense tell us about the meaning relationships which hold between terms for a subject. If one is asked to "freely associate" whatever he wants to a given term, it is obvious that the responses may be the result of many factors other than what the individual has in mind by the "meaning" of the stimulus word. (After all, this is why the technique is used in psychoanalysis.) And ignorance often enters into such associations: Bagdad has as its most common associate India, but it surely cannot be part of the meaning of Bagdad for anyone (see "Dictionary" in Deese, 1965).

The present report follows Fillenbaum and Rapoport (1971) rather than Osgood in characterizing the notion of a semantic space or network. Osgood required the subjects to associate pairs of bipolar adjectives (the scales) with selected nouns; a matrix of interconnections among the scales was computed and factor-analyzed to yield a semantic space of small dimensionality. The present report does not require the use of bipolar scales to determine the location of a term. Rather it asks the subjects to give similarity

ratings of pairs of terms and uses multi-dimensional scaling (MDS--to be described below) methods to determine a minimum dimensionality; the location of terms on these dimensions may then be analyzed to determine what bipolar adjectives might be associated with these dimensions. That is, rather than "prompting" the subjects by stating in advance what the dimensions might be, the subjects unwittingly construct their own dimensions. (It is assumed that the scales determined in this manner will yield the aforementioned "dimensions of meaning".)

Fillenbaum and Rapoport used three procedures to obtain data: (1) tree construction, (2) construction of complete, undirected graphs, and (3) direct grouping or classification. I reject the third procedure as it imposes (perhaps unjustifiably) a hierarchical structure on the data. The first two procedures are very tedious for the subject. They involve the assigning of a rank ordering to every possible pairwise combination of terms and also to every possible combination of groups of terms. This involves an immense number of judgments of relative similarity of meaning ($(n-1)!$ judgments on n terms), leading to subjects' inability to make meaningful judgments, especially in the middle parts of the experiments. Furthermore, subjects are not allowed to assign the same rank to any two comparisons, even if they want to.

The present procedure differs first in only insisting on pairwise comparisons of meaning-similarity, thus reducing

the number of judgments to $n(n-1)/2$. Secondly, subjects were first to scan the list and pick out the most similar pair and the least similar pair, and assign the values 1 and 9 respectively. They then had "anchoring points" to compare their later judgments against (since they had been forced to make choices for extremes); they were allowed to assign to different comparisons the same rating which, together with the small number of different scale values, make their comparisons meaningful; they had their attention focussed on elements of the given domain only (instead of constructing "new" members of the domain by considering combinations -- partial trees -- of the original list); and they did not have to go back and change any ratings (as they might if they were to simply start making judgments and later come across a pair which was "more different" (or "more similar") than any they had encountered up to that point.

In analyzing their data, Fillenbaum and Rapoport pooled data from their subjects. This seems suspicious, in spite of their considerations (pp. 25-29), since it would be presumptuous to assume that the same features (dimensions of meaning) are equally prominent for different subjects. And given that the judgments are not unidimensional, even if all subjects agreed on what meaning-dimensions were important, they might very well disagree on the relative importance of them. In fact, it is a part of the purpose of this thesis to investigate the cogency of the assumption that people

actually do agree on these dimensions.¹

At an intuitive level the MDS method can be understood like this. Suppose you want to locate, in space, a point. No dimensions are required to measure its distance from itself. Now suppose you add another point to the space. There are two possibilities: either it coincides with the first point or it doesn't. In the former case, one still requires no dimensions to measure the distance between the two points. In the latter case the distance can be measured in one dimension, call it A. If we add a third point, we again have two possibilities. Either it will fall on dimension A (the line connecting the first two points) or it won't. If it does fall on A, no further dimension is needed to measure the distances amongst the three points. If it doesn't fall on A, a new dimension B is called for; and the resulting measurements of distance can be described as falling on the plane AB. If a fourth point is now added to the space, it might fall on the plane AB, or not. If not, a third dimension C is required to measure all distances, and ABC will determine a three-dimensional space. A fifth point may or may not fall in the ABC space; if not, a fourth dimension D is required to measure all the distances, and ABCD determines a four-dimensional space.

An MDS analysis of n points starts by postulating the $(n-1)$ maximal number of dimensions required to describe the

¹ This question is studied in more detail in Magnera (1977).

distances amongst the n points and searches to see if they are all really necessary. Whenever two dimensions overlap -- that is, whenever the points being measured can be measured accurately without recourse to one of the dimensions -- the analysis collapses two dimensions (i.e., deletes one of them). Furthermore, when the deletion of a dimension will introduce very little measuring error, the dimension is deleted and the amount of error is recorded. This is done by deleting the dimension whose deletion introduces least error first; deleting the dimension whose deletion introduces next-most error second; etc. The error is cumulative and measured as stress (Kruskal 1964), which indicates how close the new interpoint distances are as compared to the original. Stress is a normalized sum of squared deviations (an analogue of the standard error of estimate in regression analysis).

Let $p(i,j)$ be a proximity measure on the points i and j , and $d'(i,j)$ be a function on $p(i,j)$ such that

$$(1) \quad d'(i,i) = 0$$

$$(2) \quad \text{If } p(i,j) = p(k,m), \text{ then } d'(i,j) = d'(k,m)$$

$$(3) \quad \text{If } p(i,j) < p(k,m), \text{ then } d'(i,j) > d'(k,m).$$

Let $d(i,j)$ denote the distance between points i and j . Then for a specified number of dimensions r , the stress, S , for N points can be computed by¹

¹ The present account mirrors Fillenbaum and Rapaport (1971, p. 21).

$$S = \sum \sum (\bar{d}(i,j) - d'(i,j))^2 / \sum \sum \bar{d}(i,j)^2$$

Not surprisingly, stress increases with increase of N and decreases with increase of m. When the stress required to delete another dimension becomes "too great" we do not delete and treat that as our "optimal dimensional representation."

The present study uses the recommendations of Stenson and Knoll (1969) in this regard. Further, the results reported in Young (1970, Table 3) can tell us when the amount of stress is "too great" to permit a sufficiently high degree of metric determinacy in a given solution, and it turns out that using the value we have in this study does give a very high degree of metric determinacy. This is so because "in most standard cases of interest, the data so heavily overdetermine the solution that the particular measure of goodness of fit that (one chooses to) optimize generally has only a negligible effect on the result" (Shepard, 1969, p.30, as quoted by Fillenbaum and Rapaport 1971, p.22).

The distance between any two points (as used in the formulae above) can be measured in a variety of ways. The above discussion rather implicitly assumed that the measurement will be Euclidean -- that is, that the distance between points i and j, $\bar{d}(i,j)$, can be measured from a third point k by the formula:

$$\bar{d}(i,j)^2 = \bar{d}(i,k)^2 + \bar{d}(j,k)^2 - 2 \cos A \bar{d}(i,k) \bar{d}(j,k)$$

where A is the angle made at the juncture of the lines from

i to k and j to k. One might also use non-Euclidean measures of this distance. However, it seems to follow from Shepard's (1969) work that the Euclidean metric is very robust so long as one can assume a continuous underlying space of some well-defined dimensionality. As the theoretical discussion of a subjective lexicon implied, we take this assumption to be part of the concept of a subjective lexicon. With this assumption, "the data so overdetermine the representation that erroneous assumption of a Euclidean metric will still permit a satisfactory recovery of the true underlying structure and, indeed, even a determination of the unknown metric" (Shepard, 1969, p.34; as quoted by Fillenbaum and Rapoport, 1971, p.24).

A multi-dimensional scaling analysis which allows for the assessment of individual differences (e.g., the INDSCAL program) can intuitively be understood as being a way of finding an "average" common-word-space for all the subjects rating the same group of terms. The words can then be placed in this common word space and then an analysis of the dimensions used can be given which shows how those terms relate to this common-for-all-subjects word space. The subjects are assigned scores which amount to a measure of

the salience of each dimension for them.¹

The possibility of using hierarchical clustering analyses (described below) on the data obtained will also be investigated. However, it is not expected that this method will be necessarily appropriate, since hierarchical clustering is most appropriate with data that can naturally be assumed to be grouped into superordinate/subordinate classes; and the present domains are not expected to be structured this way. It is possible, though, that some new information can be forthcoming about the underlying structure of these domains if the hierarchical clustering results are consistent with the MDS results. Roughly speaking, this means that given a low-dimensional representation of the data, the clusters indicated by the hierarchical grouping are also "natural, simple and compact" in the dimensional representation (cf. Fillenbaum and Rapoport, 1971 p.39).

However, an HCP analysis of the weightings given to each subject by the INDSCAL analysis can show us groups of subjects who view the dimensions in a similar way. This use of HCP can be very useful in describing those subjects who perform the same in their judgments of similarity.

¹ Of course, this intuitive explanation is not strictly speaking correct. Actually, the within-subject normalized similarity scores are all used to construct an overall word space for all terms in which they can be located. Then a weighting factor is assigned to each subject for each dimension; this weight measures the contribution of that dimension in accounting for the scores of that subject.

A hierarchical cluster analysis of the similarity-of-meaning data is a way of converting it into a taxonomic system. Intuitively what happens is this: as input we are given a distance measurement from any term to any other. We search for two terms which are most similar to each other, that is, they are most similar to each other when one compares their distances from all the other terms. After these two terms are found they are grouped together and considered a new term with a specified distance from all other terms, while the original two individual items are deleted. This procedure is repeated until there is but one term (group) left. The output of such a procedure is a hierarchical classification of terms into groups ("clusters") and sub-groups, and, in the method used in this thesis, with a measure of how much "error" is introduced by deleting the terms in favour of the construction of a new term, the "cluster."

The method must specify for a newly-constructed cluster, a distance from it to each of the remaining terms or clusters. There are at least three reasonable ways to do this. The distances from the cluster constructed out of i and j to some other element k might be taken to be the minimum of the distances from i to k and j to k , the maximum of the distances from i to k and j to k , or the average of the distances from i to k and j to k . That is, where $d(i,j)$ is the distance from i to j , and $d((i,j),k)$ is the to-be-constructed distance from the cluster (i,j) to k , we can

choose any of these:

$$d((i,j),k) = \min(d(i,k), d(j,k))$$

$$d((i,j),k) = \max(d(i,k), d(j,k))$$

$$d((i,j),k) = (d(i,k) + d(j,k)) / 2$$

In general, choice of constructing new distances will yield different hierarchical solutions for the same data. (See Fillenbaum and Rapoport, 1971 pp. 31-32 for an example demonstrating that the "min" and "max" choices yield distinct hierarchies). In the present study the method of maximizing was used. (See Johnson, 1967, for reasons to choose this so-called diameter method rather than the minimizing ("connected") and averaging methods.)

MDS and hierarchical clustering procedures represent distinct structural models according to which one analyzes the similarity-of-meaning data. Each procedure analyzes the data according to a different goal, and it is clear that choosing to do one rather than the other amounts to a commitment that the underlying, true structure of the data has a certain form. Any set of ordinal proximity data can be subjected to a hierarchical clustering analysis, and a certain hierarchy will be output. However, the interpretability of the resulting hierarchy is not only a function of which hierarchy is the output of the analysis, but also of the a priori plausibility of the assumption that the underlying, true structure is hierarchical. So, from a mathematical point of view, hierarchical clustering analyses make very weak assumptions about the data -- only that they

are ordinal; however, the method makes a very strong, and somewhat implausible (from the point of view of the structure of the subjective lexicon), assumption about the underlying structure of the data -- that it is class-inclusive in nature. MDS, on the other hand, makes comparatively strong assumptions about the data: that there is a continuous underlying space of some well-defined dimensionality, and that the distances between points are "additive" in the same dimension (indeed, in the present study, Euclidean additive); however, these mathematically strong assumptions have a high degree of a priori plausibility about the true underlying structure of the subjective lexicon.

For any individual and domain, the term which has the lowest mean score is that term which the subject sees as being the most similar in meaning to the other terms in that domain. The term with the smallest standard deviation will be that term which is viewed as the most "stable" in meaning of the terms in that domain. So analyses of these more traditional sorts can also yield valuable information about how the subjects perceive the semantic domains. By pooling these similarity judgments, we can arrive at an overall semantic space for all subjects (that is, a low-dimensional representation of the "average" low-dimensional representations). Against this space we can plot subjects to see whether they form distinguishable groups. We can therefore also discern whether these groups correspond to the various

schools of philosophy (for those judgments of the professional philosophers), and whether the "educated" philosophers' groups correspond to those of the naive subjects.

CHAPTER II

METHOD AND PROCEDURE

Subjects and Apparatus

Two groups of terms commonly occurring in philosophical discussions were used. They were given the names "Science Terms" and "Action Terms" to indicate the areas of philosophy in which they are prevalent (philosophy of science and action theory). The members of these groups are given in Tables I and II. In each group the terms were presented to subjects as an upper triangular matrix (minus diagonal) as in the example shown in Figure 1.

Two groups of subjects were used. One group consisted of 10 professional philosophers who were teaching philosophy at either the University of Alberta or the University of Calgary during the academic year 1972-1973. All these subjects had received the degree of Ph.D. in philosophy. They ranged in age from 28 to 63 (median 32). Nine were male, one female; all were native speakers of English. The second group consisted of 33 undergraduate students at the University of Alberta. (Three of the students, 1 male and 2 females, did only the shorter Action Terms, saying that they found the Science Terms task too time-consuming and/or difficult). None of these students had completed a first course in philosophy, although some were in the process of taking such a course. There were 14 males and 19 females in

	ACCIDENTAL	CAUSED	COMPELLED	DETERMINED	EFFORTLESS	FREE	INADVERTENT	INVOLUNTARY	MECHANICAL	SPONTANEOUS	THOUGHTLESS	UNCAUSED
ACCIDENTAL.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CAUSED.....		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COMPELLED.....			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DETERMINED.....				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EFFORTLESS.....					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FREE.....						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INADVERTENT.....							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INVOLUNTARY.....								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MECHANICAL.....									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SPONTANEOUS.....										<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
THOUGHTLESS.....											<input type="checkbox"/>	<input type="checkbox"/>
UNCAUSED.....												<input type="checkbox"/>

Figure 1: Upper Triangular Matrix of Terms (Action Terms).

Table I: Action Terms

1. ACCIDENTAL	7. INADVERTENT
2. CAUSED	8. INVOLUNTARY
3. COMPELLED	9. MECHANICAL
4. DETERMINED	A. SPONTANEOUS
5. EFFORTLESS	B. THOUGHTLESS
6. FREE	C. UNCAUSED

Table II: Science Terms.

1. ANALYTIC	C. NECESSARY
2. A PRIORI	D. OBJECTIVE
3. CONCEPTUAL	E. OBSERVABLE
4. CONTINGENT	F. PROBABLE
5. CONVENTIONAL	G. REASONABLE
6. EMPIRICAL	H. REGULAR
7. ESSENTIAL	I. SUFFICIENT
8. GIVEN	J. THEORETICAL
9. HYPOTHETICAL	K. TRUE
A. LAWLIKE	L. VALID
B. NATURAL	

this group of 33. Their ages were between 17 and 33 (median 20). All were native speakers of English.

Procedure

All subjects were given the instructions reproduced as Figure 2. It will be noted that the instructions call for judgments of similarity of meaning without further clarification of that concept. Many subjects, especially among the philosophers, requested clarification of this. None was given other than "Use whatever criteria seem appropriate to you for this task."

The upper triangular matrices given to the philosophers had the terms in alphabetic order, as per the sample shown

Figure 2: Instructions to Subjects.

This study is designed to gather information about your judgments of the relative similarity of meanings of words. You will be presented with a set of words drawn from some definable field.

Consider a simple and fairly well-ordered example. A set of adjectives that could be used to describe temperature sensations are:

BOILING, COLD, COOL, FRIGID, HOT, TEPID, WARM

You would be asked to assess the similarities in meaning of these terms by means of numbers from 1 to 9. The first step in this procedure is to scan the entire list to find the pair of words you judge to be most similar in meaning and assign that pair a 1. Next, you are asked to find the pair you consider to be least similar in meaning and assign that pair a 9. These judgments would constitute "anchor points" for your further use of the 1 -- 9 scale.

The list will actually be presented as an "upper triangular matrix" of boxes to facilitate comparisons among pairs of terms, and would look like this:

	BOILING	COLD	COOL	FRIGID	HOT	TEPID	WARM
BOILING.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COLD.....		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COOL.....			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FRIGID.....				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOT.....					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TEPID.....						<input type="checkbox"/>	<input type="checkbox"/>
WARM.....							<input type="checkbox"/>

Let's assume, for example, that you judge the pair COLD/FRIGID to be the most similar in meaning; and the pair FRIGID/BOILING to be the least similar in meaning. You would assign the value 1 to the box for the first pair, and the value 9 to the box for the FRIGID/BOILING comparison. This step has provided the "anchor points" in terms of which you will go on to evaluate the similarities in meaning of the rest of the pairs of terms. Note that any of the values from 1 to 9 may be used for any comparison so that if, for example, you judge the pair HOT/BOILING to be just as similar as COLD/FRIGID, both pairs may be assigned the value 1, or any other value you deem appropriate. A complete matrix for this example might look like this:

Figure 2 (continued):

	BOILING	COLD	COOL	FRIGID	HOT	TEPID	WARM
BOILING.....	[8]	[6]	[9]	[1]	[5]	[3]	
COLD.....		[2]	[1]	[8]	[4]	[6]	
COOL.....			[3]	[6]	[2]	[3]	
FRIGID.....				[8]	[5]	[6]	
HOT.....					[4]	[2]	
TEPID.....						[2]	
WARM.....							

The sets of terms which you will be asked to judge will not be as readily ordered as these, but with some preliminary thought on your part, you should be able to complete the task. There is no time limit and there is, of course, no known "correct answer." We are interested in finding out how users of the language perceive the relative similarity in meaning among terms from a semantic domain; therefore, the only correct response is the one which represents, as precisely as possible, the way you see the relationships.

In doing the task, please consider each list separately. The judgments you are making are not absolute, but simply relative to the set of terms actually given to you. Restrict your attention, then, to the individual set given.

in Figure 1. Those given to the students were randomized as to the order of the terms presented, as per the example shown in Figure 3. (The randomized matrices were computer-generated and the answers unscrambled by a program developed by John Grey, then of the University of Alberta Linguistics Department. The program, SemComPac, is available through the University of Alberta Computing Services).

The philosophers were asked various questions designed to place them within one or another tradition in, or school of, philosophy. In the present English-speaking world, there are three dominant philosophic traditions: analytic philosophy, continental philosophy, and religious philosophy (of which the most common is neo-Thomism). Of course, there are finer sub-divisions within each of these main trends, but it is clear (and recognized by all) that these are the main present-day traditions. And of course, there is bound to be some overlap in training, but almost every philosopher has the vast majority of his education and research in just one of these areas. Which tradition it is can be ascertained by asking, or by looking at what school the Ph.D. is obtained from, or by asking for the name of a famous (modern) philosopher he feels "of a like mind with," or in what area his research is. All of these sorts of questions were asked of the philosophers. The result was that they all considered themselves to be analytic philosophers, although one had done some training and research in Continental philosophy (mostly of the "bridge the gap between

	E M P I R I C A L	S U F F I C I E N T	E S S E N T I A L	R E A S O N A B L E	G I V E N	O B J E C T I V E	P R O B A B L E	N E C E S S A R Y	A N A L Y T I C	T H E O R E T I C A L	C O N V E N T I O N A L	T R U E	A P R I O R I	O B S E R V A B L E	C O N T I N G E N T	N A T U R A L	R E G U L A R	L A W L I K E	H Y P O T H E T I C A L	V A L I D
CONCEPTUAL	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
EMPIRICAL	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
SUFFICIENT	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
ESSENTIAL	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
REASONABLE	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
GIVEN	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
OBJECTIVE	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
PROBABLE	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
NECESSARY	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
ANALYTIC	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
THEORETICAL	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
CONVENTIONAL	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]	[]
TRUE	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]	[]
A PRIORI	-	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]	[]
OBSERVABLE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]	[]
CONTINGENT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]	[]
NATURAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]	[]
REGULAR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]	[]
LAWLIKE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[]	[]
HYPOTHETICAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[]
VALID																				

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Figure 3: Randomized Upper Triangular Matrix of Terms (Science Terms),
Photoreduced.

analytic and continental philosophy" sort) and two had done some training and research in Religious philosophy (but again, mostly of the "compare" sort). Within one of these traditions, one specializes in a certain area of philosophy. Since we can consider our philosophers to be basically in one group, analytic philosophers, we might try further sub-grouping on the basis of their specialization. This was ascertained by direct questioning and comparison of this answer with their dissertation topics and published research areas. The results of this are shown in Table III (of Chapter III).

As mentioned in Chapter I, the present task is considerably simpler than various other ways of measuring "similarity of meaning." On n terms, this task requires $n(n-1)/2$ judgments; undirected tree-construction requires $(n-1)!$ judgments; and sorting requires something between these two numbers (depending on the sorting strategy involved). Furthermore, these instructions require the subject to first pick out a "maximally similar" and a "maximally dissimilar" pair first, thereby giving "anchoring points" against which to make the remaining judgments -- something which is lacking in both sorting and tree-construction tasks. As an added benefit, the present procedure, unlike the others, allows subjects to rate two distinct pairs as "equally similar." And finally, it seems to be marginally preferable, all other things being equal, to ask subjects for their judgments directly, rather than by

the devious, indirect methods invoked in the other two procedures mentioned. Of course, order of presentation will be expected to affect the results of the present method more than that of the other methods; and it is for this reason that the students were given the randomized matrices. (The SemCompac program was not available when the philosophers were tested. It is hoped that their education and experience in study of these terms will lessen the impact of alphabetic order of presentation.)

The results of the similarity judgments were fed into an INDSCAL program on the University of Alberta computer to yield a common-to-all-philosophers space for terms (for each of the two groups of terms). Against this space, the philosophers are mapped, so that comparisons amongst philosophers can be perceived. A hierarchical clustering program (HCP) then took their individual weighting factors on such a space and formed groups of philosophers (for each of the two sets of terms) in accordance with whether they had the same judgments of similarity of meaning of those terms or not. A typical member of each group was then chosen for individual study. This individual study was done rather "clinically" -- such a typical philosopher had a MDS program run on his responses, and his subjective lexicon was intuitively characterized (by considering properties of his "dimensions of meaning"). Furthermore, the means, standard deviations, etc., of the similarity ratings of the individual terms of these typical philosophers were studied in order to more

fully characterize his view of that set of terms. The same procedure was followed with the group of students. Finally each of the "typical philosophers" was examined by comparison with the HCP groups formed from the students' INDSCAL weighting factors to determine whether the students' groups are the same as the philosophers' groups.

CHAPTER III

RESULTS AND DISCUSSION

Makeup of the Philosopher Sample

The results of the questions asked of the philosophers to determine their membership in a philosophic tradition and their fields of specialization within that tradition are summarized in Table III. It should be noted that there are

Table III: Classification of Philosophers and their Fields of Specialization

<u>Subject No.</u>	<u>Tradition</u>	<u>Fields of Specialization</u>
1	Analytic	Phil.Mind,Phil.Educ., Continental
2	Analytic	Phil.Mind,Ethics
3	Analytic	Marxism,Aesthetics
4	Analytic	Phil.Mind
5	Analytic	Aesthetics
6	Analytic	Mediaeval Phil.
7	Analytic	Phil.Mind,Phil.Lang.
8	Analytic	Marxism,Phil.Lang.
9	Analytic	Phil.Religion
A	Analytic	Phil.Religion,Metaphysics

no members of either the Continental School nor any Religious School. This lack of representation of philosophical traditions other than analytic is regrettable, but was forced upon the experimenter by the makeup of the philosophy departments in Alberta. (There are no religious philosophers, and the only Continental philosopher who was a native

speaker of English declined to participate.)

INDSCAL for the Philosophers

As discussed in Chapter II, an INDSCAL analysis is a form of multi-dimensional scaling where a common space of low dimensionality (here: three dimensions) is found for the terms being judged, and the subjects are located in that space. The INDSCAL analysis therefore takes the raw scores and computes a space containing (say) three dimensions according to which all subjects are judging the terms. This space can be constructed from the x -weightings¹ of the terms in three dimensions (given in Tables IV and V for the Action Terms and Science Terms respectively). The subjects have a score which is a measure of the extent to which they attach importance to each of the three dimensions. These w -weightings are given in Tables VI and VII for Action Terms and Science Terms respectively. The degree of reconstructability of the original scores from the normalized x - and w -weightings can be seen from Table VIII. With the exception of Subject 10 on Science Terms, the correlations are quite high. These normalized scores yield Figures 4 to 15: the first three are plots of the philosophers in the common word space for Action Terms, the next three are plots of the philosophers in the common word space for Science Terms, the

¹ In general, the designation x -weighting will be used to refer to the coordinates of the terms being analyzed in their object space.

Table IV: x-Weightings of Action Terms for Philosophers.

<u>Term</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1 ACCIDENTAL	-0.203	-0.301	-0.259
2 CAUSED	+0.331	+0.272	-0.084
3 COMPELLED	+0.378	-0.136	+0.340
4 DETERMINED	+0.376	+0.095	+0.316
5 EFFORTLESS	-0.081	+0.405	-0.253
6 FREE	-0.385	+0.405	+0.280
7 INADVERTENT	-0.055	-0.314	-0.343
8 INVOLUNTARY	+0.187	-0.366	-0.139
9 MECHANICAL	+0.258	+0.023	+0.159
A SPONTANEOUS	-0.350	+0.375	-0.145
B THOUGHTLESS	-0.030	-0.207	-0.370
C UNCAUSED	-0.427	-0.252	+0.497

Table V: x-Weightings of Science Terms for Philosophers.

<u>Term</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1 ANALYTIC	+0.211	+0.331	+0.209
2 A PRIORI	+0.173	+0.317	+0.233
3 CONCEPTUAL	+0.223	+0.285	+0.101
4 CONTINGENT	-0.278	-0.237	-0.407
5 CONVENTIONAL	+0.143	+0.229	-0.203
6 EMPIRICAL	-0.332	-0.269	-0.203
7 ESSENTIAL	+0.075	+0.174	+0.317
8 GIVEN	-0.349	+0.084	+0.058
9 HYPOTHETICAL	+0.177	-0.116	-0.379
A LAWLIKE	+0.180	-0.319	+0.172
B NATURAL	-0.229	-0.268	+0.125
C NECESSARY	+0.138	+0.227	+0.396
D OBJECTIVE	-0.212	-0.041	+0.116
E OBSERVABLE	-0.343	-0.227	-0.028
F PROBABLE	-0.144	-0.174	-0.309
G REASONABLE	+0.046	+0.016	-0.032
H REGULAR	+0.107	-0.282	+0.092
I SUFFICIENT	-0.012	+0.220	-0.115
J THEORETICAL	+0.406	-0.146	-0.079
K TRUE	-0.137	+0.088	+0.011
L VALID	+0.157	+0.111	+0.032

next three are the positions of the Action Words in the common space, and the last three are the positions of the Science Words in their common space. Superimposed on the

Table VI: w-Weightings of Philosophers for Action Terms.

<u>Subject</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1	0.816	0.225	0.123
2	0.702	0.338	0.295
3	0.693	0.348	0.170
4	0.625	0.262	0.286
5	0.676	0.395	0.203
6	0.660	0.396	0.196
7	0.671	0.205	0.384
8	0.606	0.488	0.275
9	0.402	0.158	0.528
A	0.393	0.496	0.441

Table VII: w-Weightings of Philosophers for Science Terms.

<u>Subject</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1	0.310	0.136	0.676
2	0.428	0.314	0.209
3	0.595	0.143	0.247
4	0.332	0.325	0.381
5	0.458	0.258	0.506
6	0.429	0.283	0.368
7	0.442	0.451	0.215
8	0.423	0.307	0.206
9	0.101	0.834	0.066
A	0.284	0.213	0.182

first six plots are the groups indicated by the HCP
(described below).

From Figures 10 to 12, a rough characterization of the three dimensions for the semantic space of the Action Terms can be given. Dimension 1 for Action Terms arranges the words from a high score for COMPELLED, DETERMINED; slightly less high for CAUSED, MECHANICAL; to low scores for FREE, SPONTANEOUS, UNCAUSED; and slightly less low for ACCIDENTAL. It is clear that this (primary) dimension is a measure of

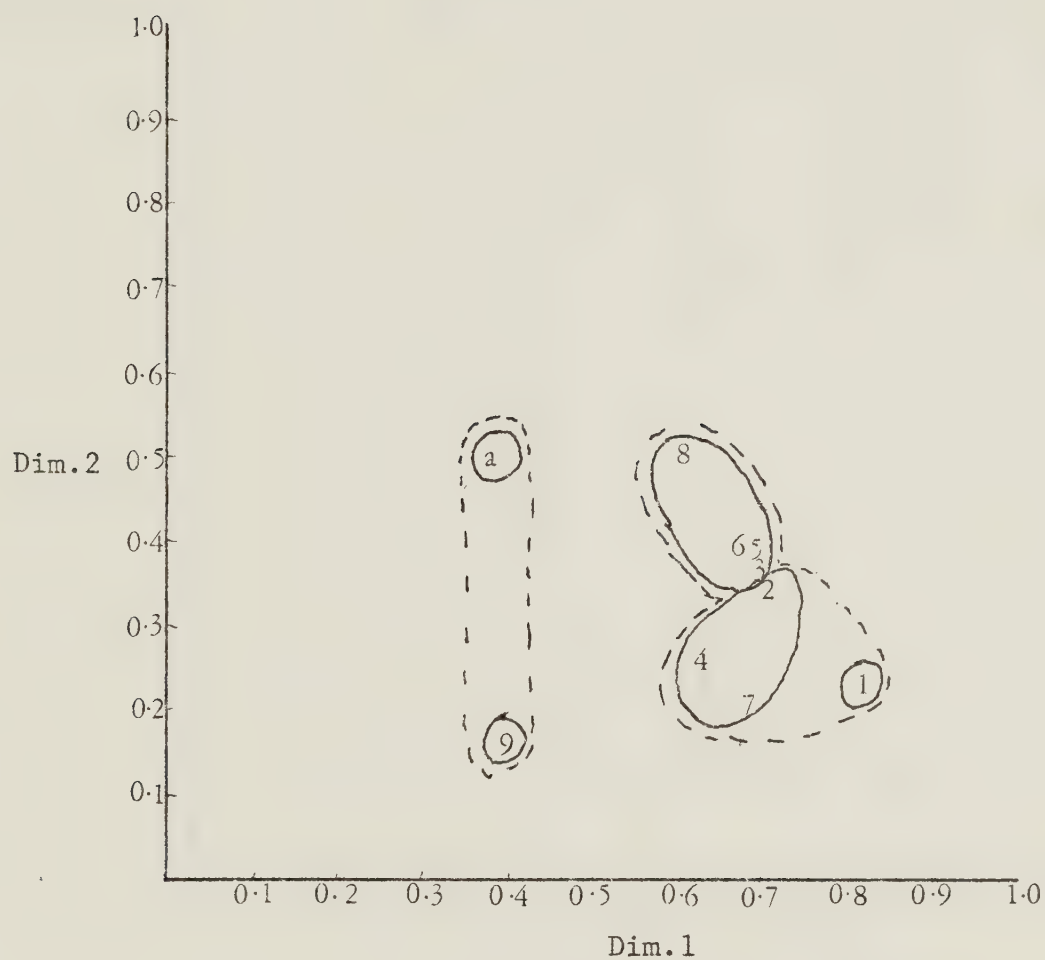


Figure 4: INDSCAL Analysis: Philosophers in Common Action Term Word Space, Dimensions 1 vs. 2. 5-group HCP solution in solid outline. 3-group solution in broken outline.

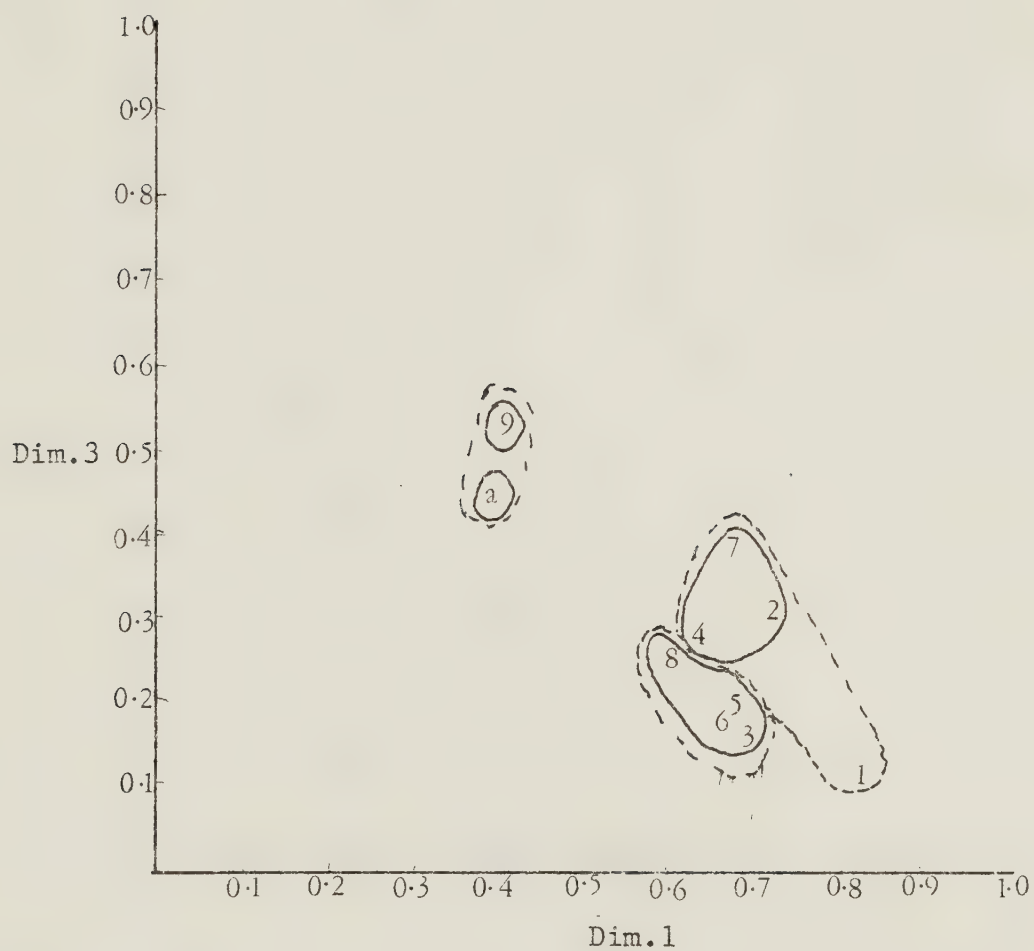


Figure 5: INDSCAL Analysis: Philosophers in Common Action Term Word Space, Dimensions 1 vs. 3. 5-group HCP solution in solid outline, 3-group solution in broken outline.

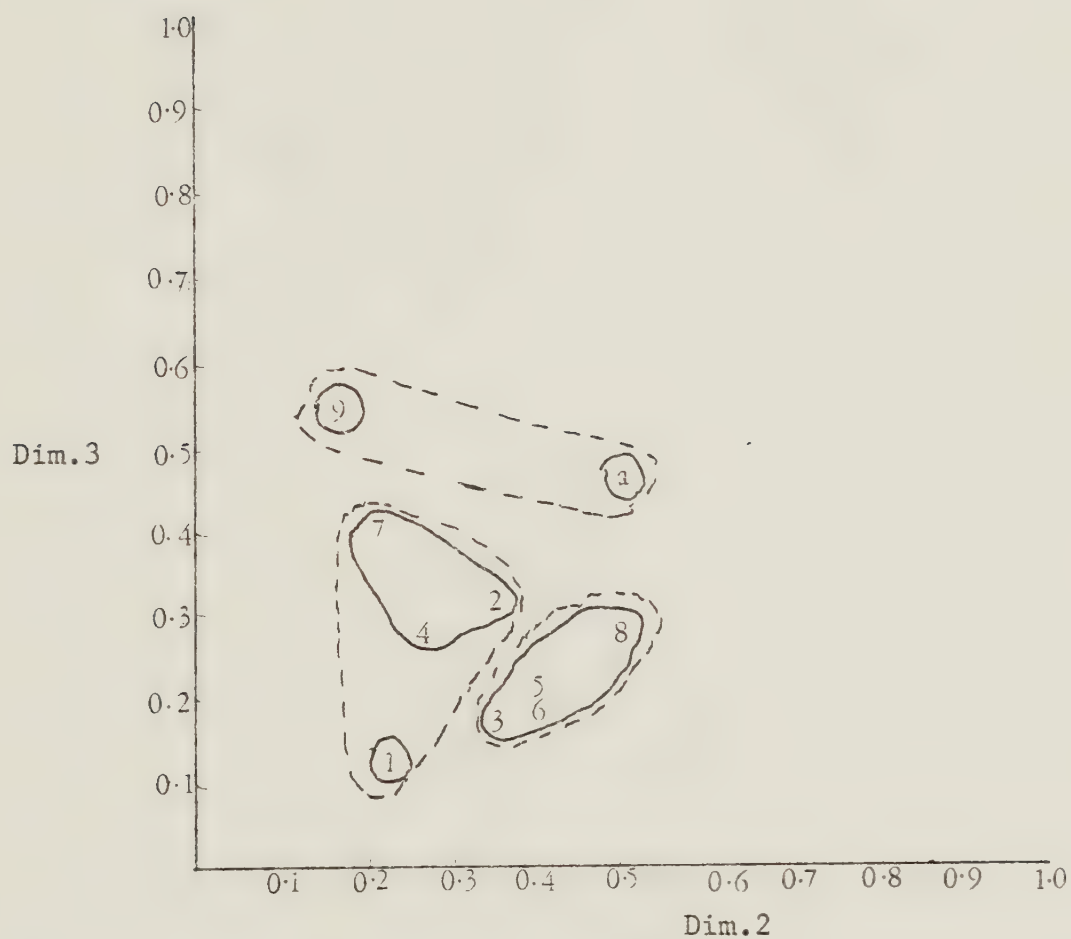


Figure 6: INDSCAL Analysis: Philosophers in Common Action Term Word Space, Dimensions 2 vs. 3. 5-group HCP solution in solid outline, 3-group solution in broken outline.

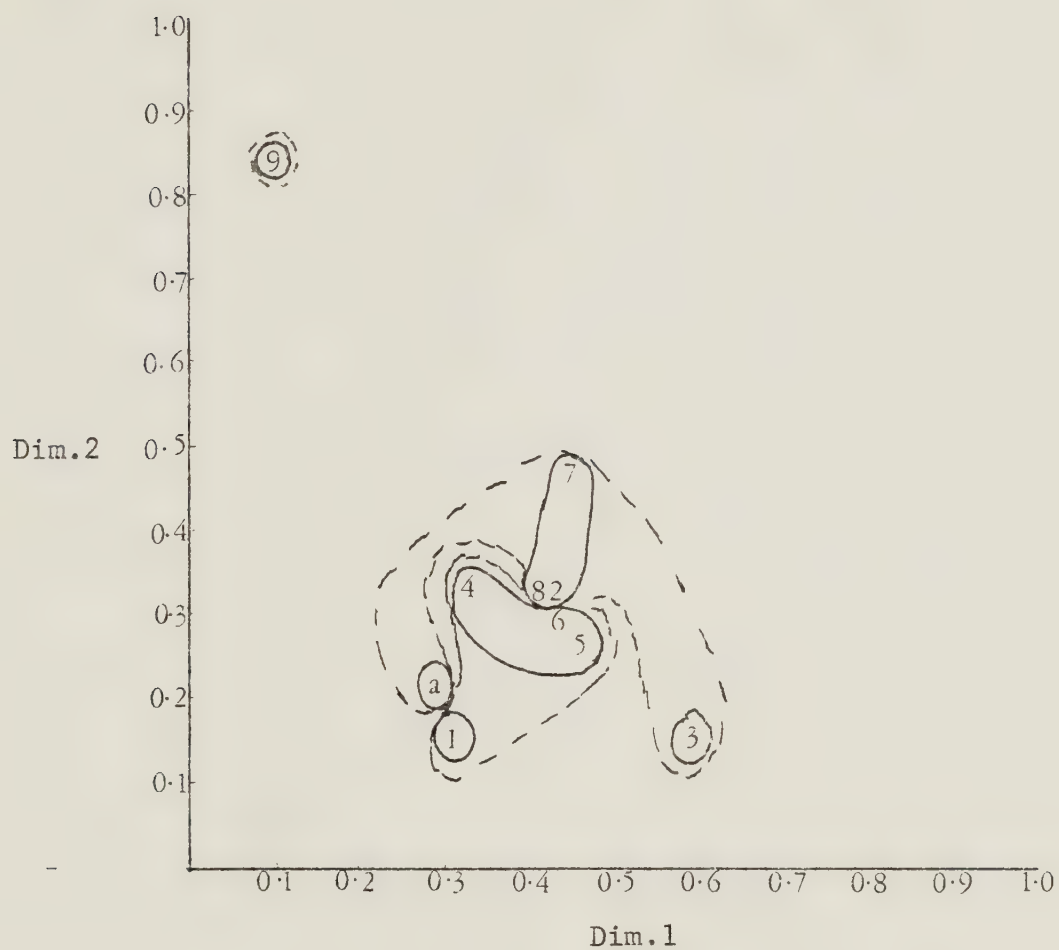


Figure 7: INDSCAL Analysis: Philosophers in Common Science Term Word Space, Dimensions 1 vs. 2. 6-group HCP solution in solid outline, 3-group solution in broken outline.

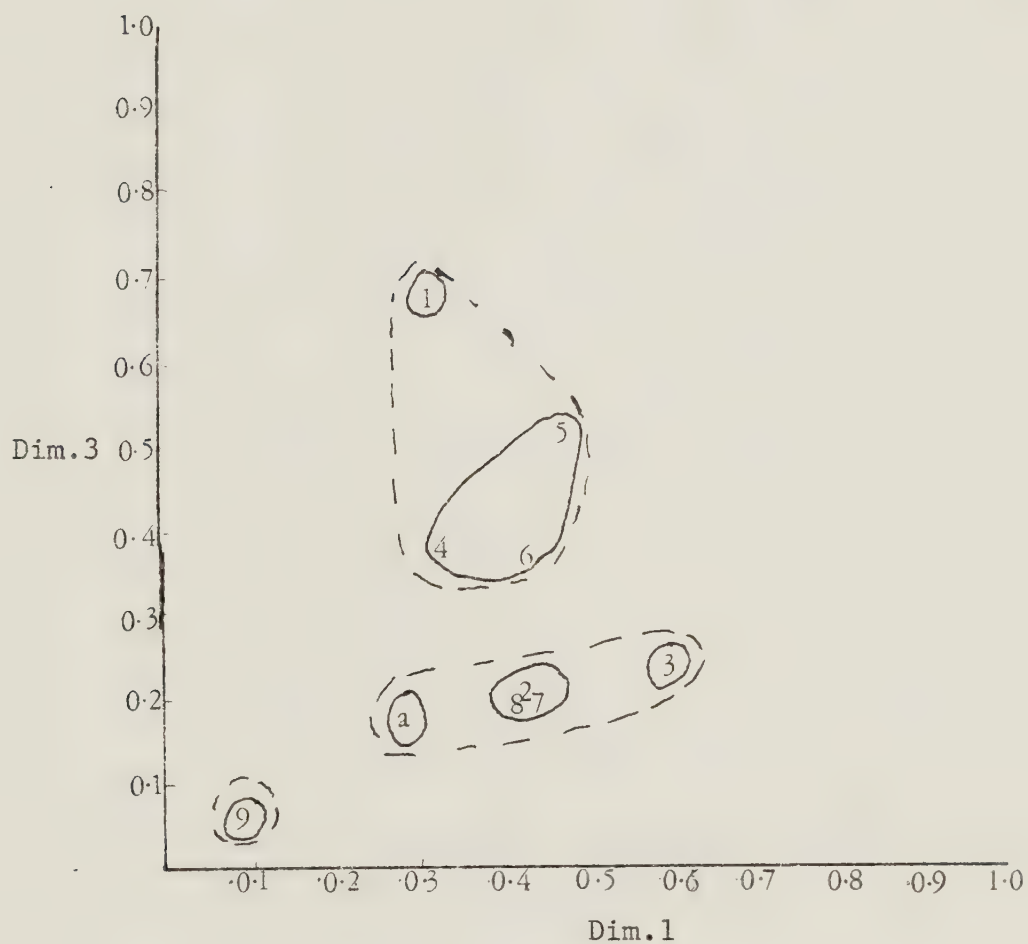


Figure 8: INDSCAL Analysis: Philosophers in Common Science Term Word Space, Dimensions 1 vs. 3. 6-group solution HCP in solid outline, 3-group solution in broken outline.

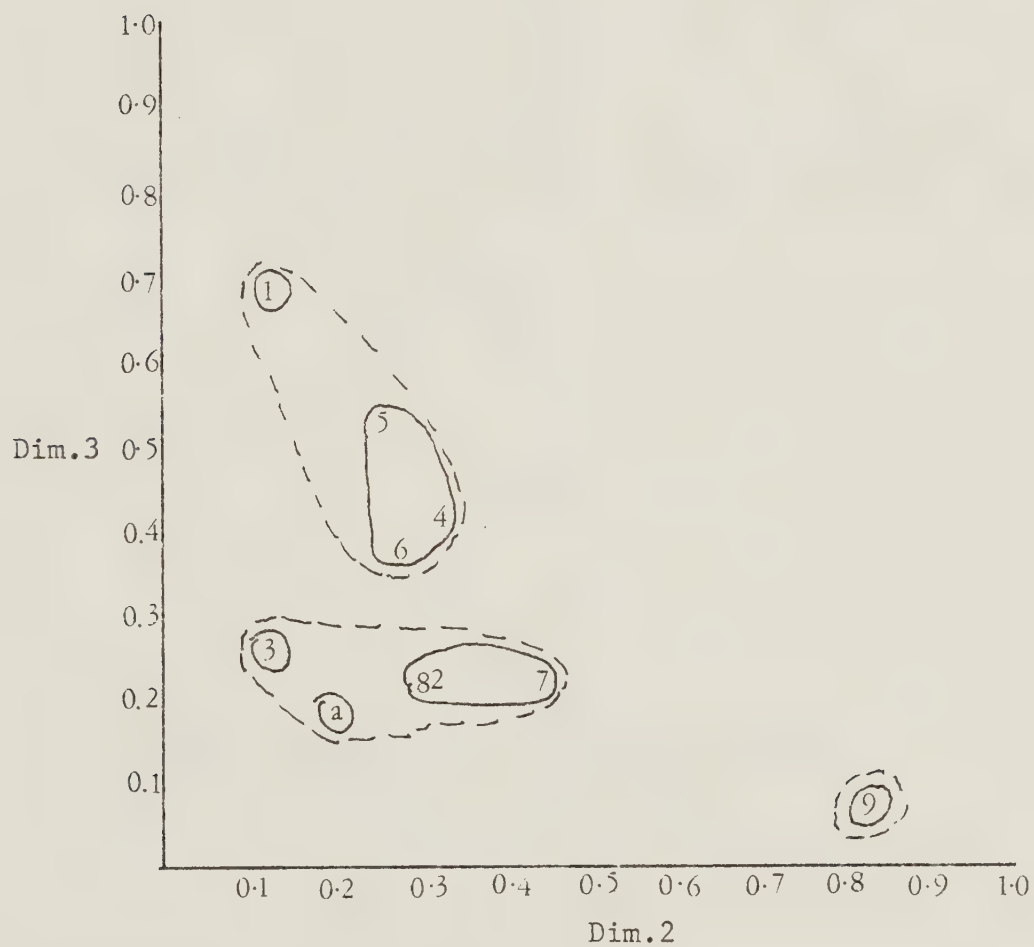


Figure 9: INDSCAL Analysis: Philosophers in Common Science Term Word Space, Dimensions 2 vs. 3. 6-group HCP solution in solid outline, 3-group solution in broken outline.

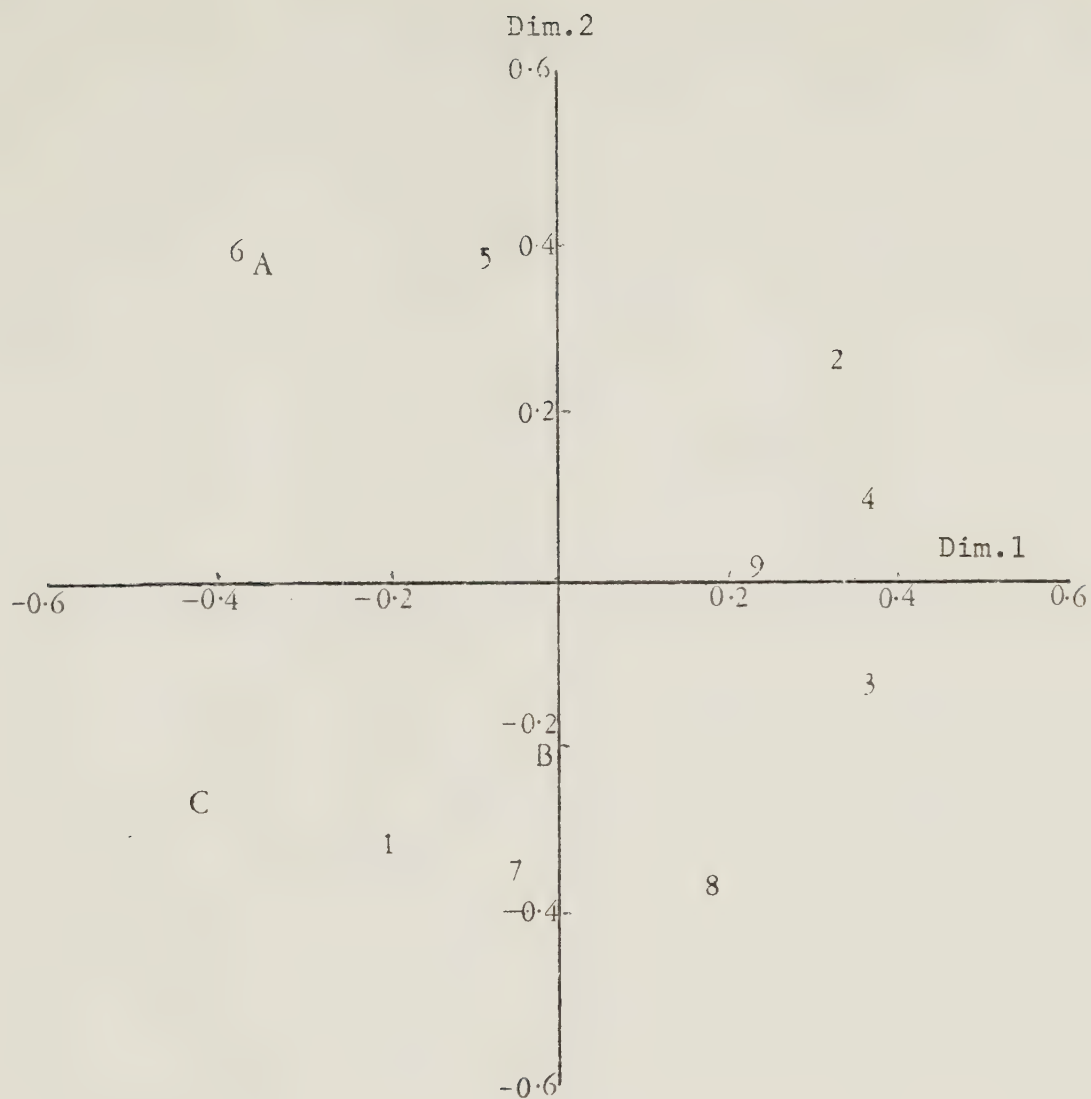


Figure 10: INDSCAL Analysis: Action Terms Placed in Common Action Term Word Space, Dimensions 1 vs. 2.

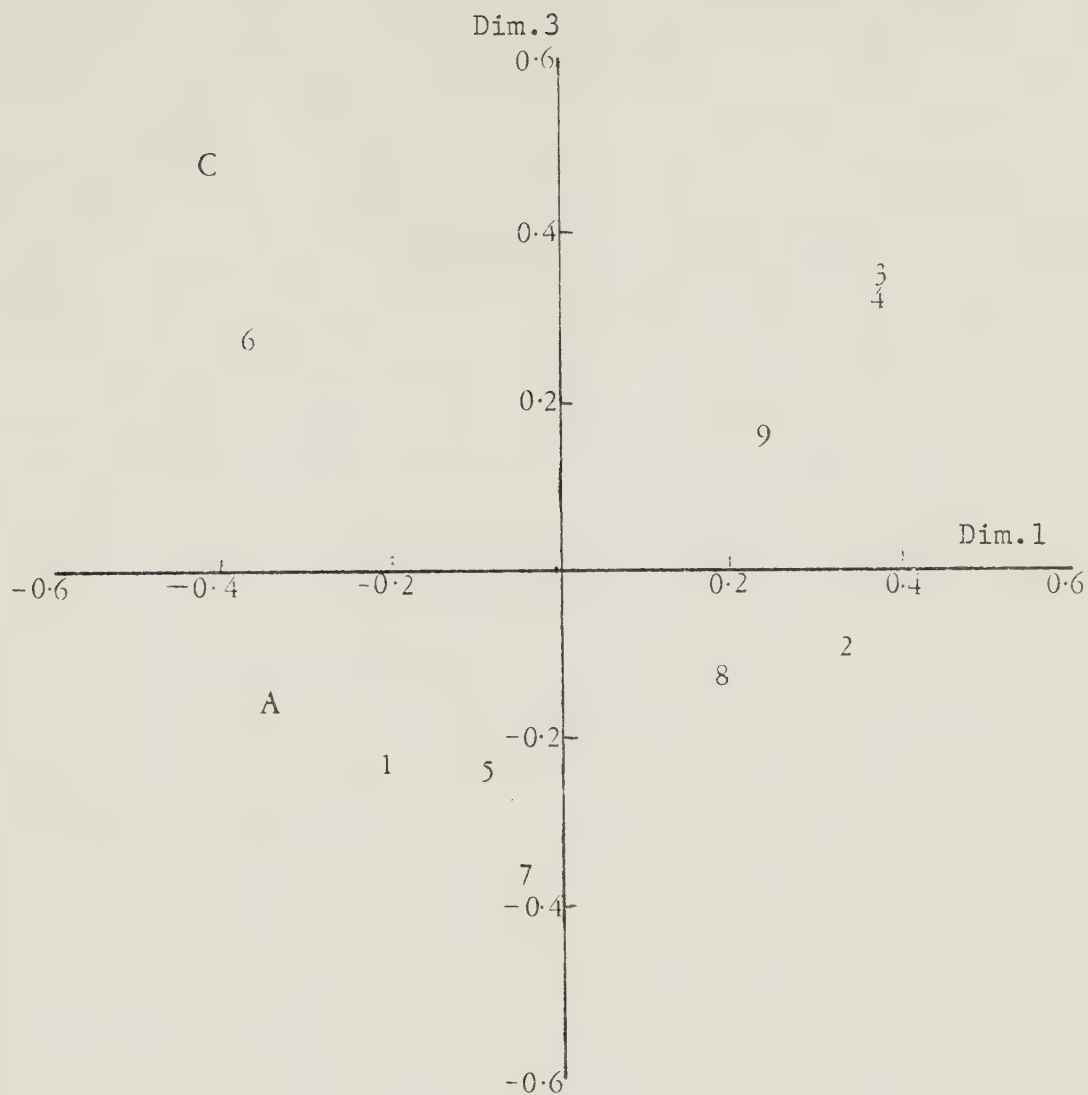


Figure 11: INDSCAL Analysis: Action Terms Placed in Common Action Term Word Space, Dimensions 1 vs. 3.

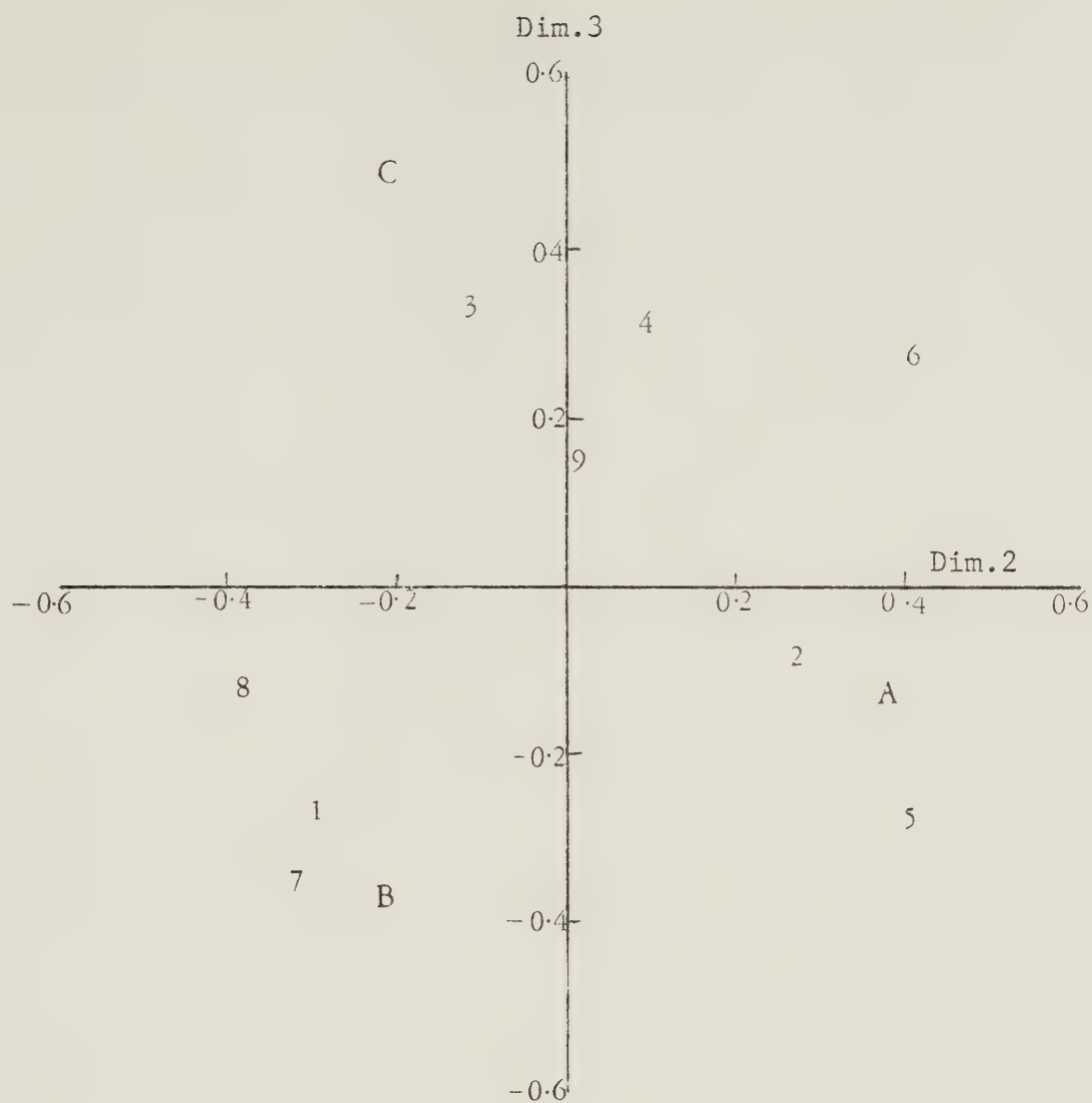


Figure 12: INDSCAL Analysis: Action Terms Placed in Common Action Term Word Space, Dimensions 2 vs. 3.

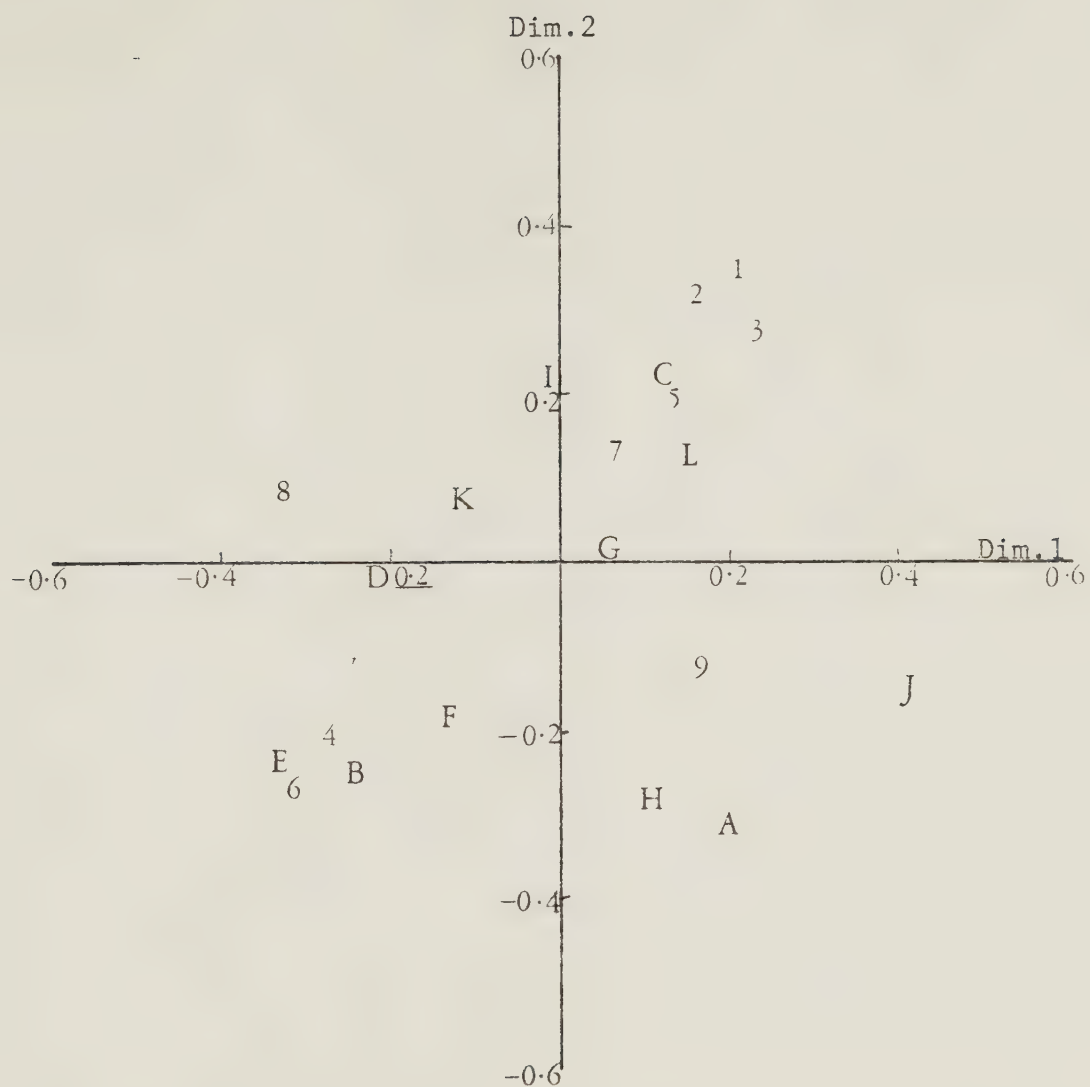


Figure 13: INDSCAL Analysis: Science Terms Placed in Common Science Term Word Space, Dimensions 1 vs. 2.

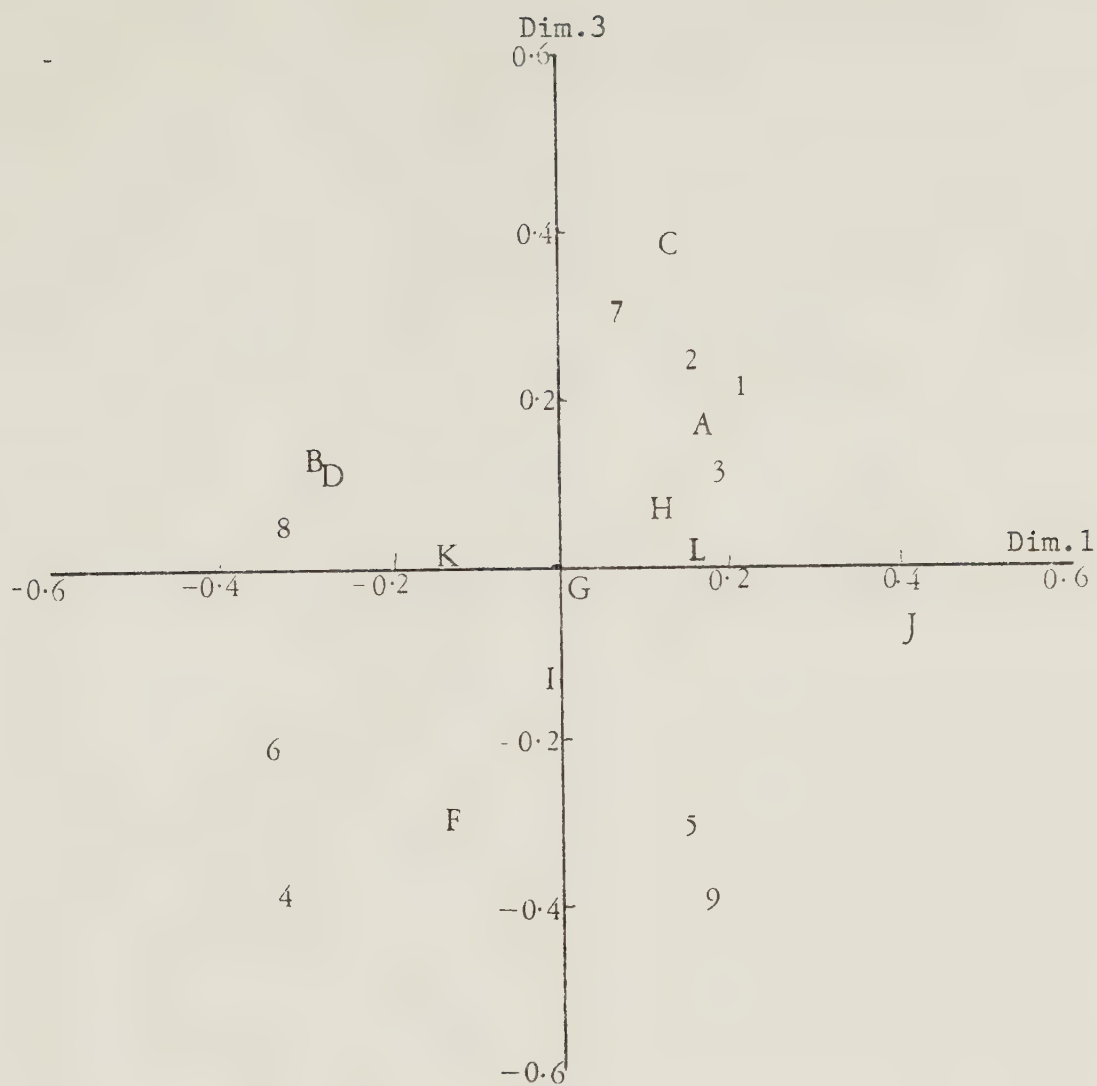


Figure 14: INDSCAL Analysis: Science Terms Placed in Common Science Term Word Space, Dimensions 1 vs. 3.

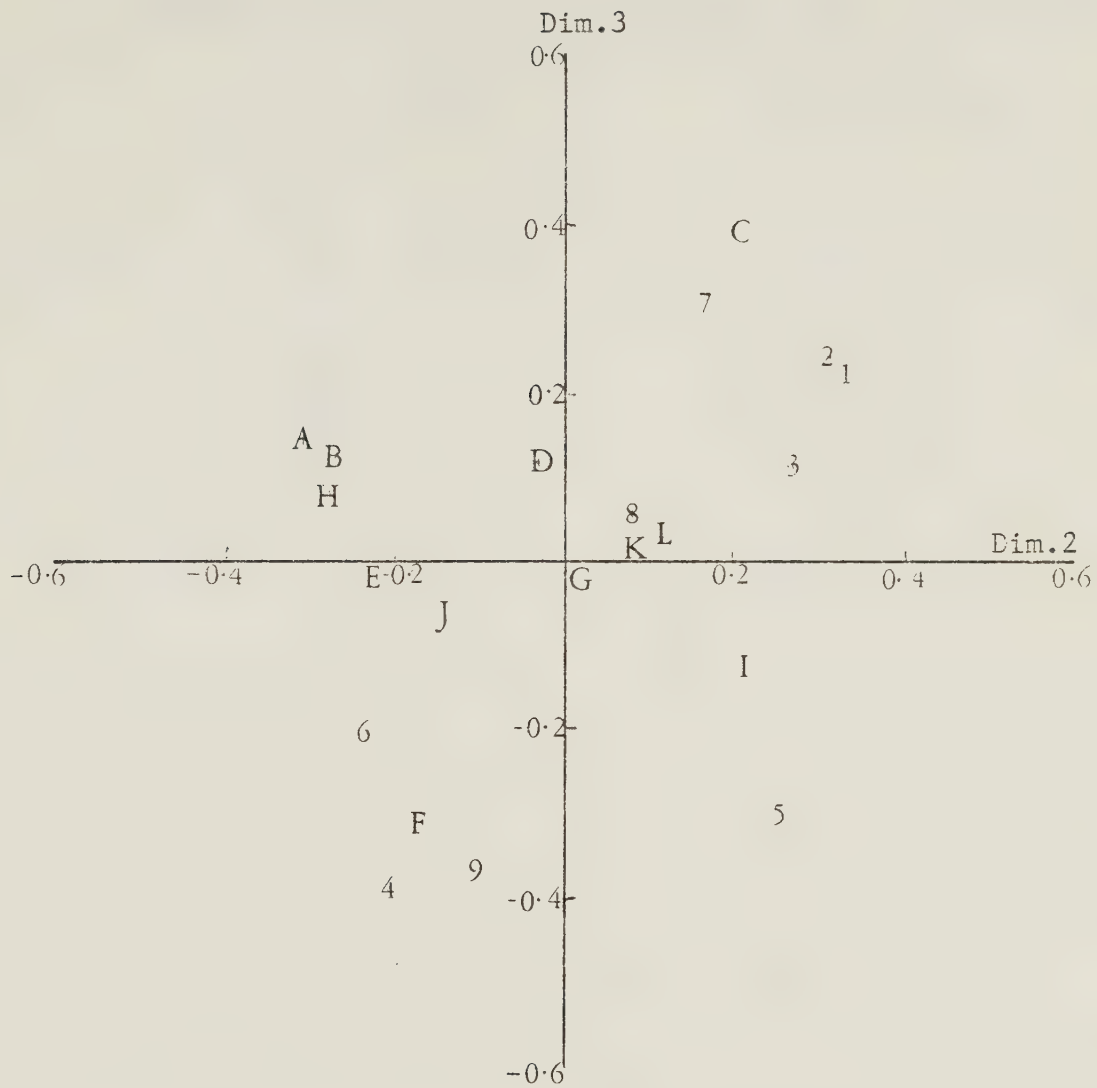


Figure 15: INDSCAL Analysis: Science Terms Placed in Common Science Term Word Space, Dimensions 2 vs. 3.

Table VIII: Correlation Between Original Data and Scores
Computed from x- and w- Weightings.

<u>Subject</u>	<u>Action Terms</u>	<u>Science Terms</u>
1	0.859	0.798
2	0.839	0.631
3	0.800	0.700
4	0.741	0.668
5	0.815	0.797
6	0.800	0.698
7	0.805	0.740
8	0.833	0.621
9	0.686	0.869
A	0.779	0.442
Average	0.796	0.696

necessitation. Dimension 2 for Action Terms arranges the words from a high score for FREE, EFFORTLESS; less high for SPONTANEOUS; still less high for CAUSED; to a low for INVOLUNTARY; slightly less low for ACCIDENTAL, THOUGHTLESS, UNCAUSED, INADVERTENT. This (secondary) dimension is a measure of the purposefulness of (human) action. Dimension 3 for Action Terms places UNCAUSED high, COMPELLED, DETERMINED less high; it places THOUGHTLESS, INADVERTENT low, ACCIDENTAL, EFFORTLESS slightly less low. This (ternary) dimension is difficult to interpret, but seems to run from "out of one's control for some external reason" to "within one's control but not attended to".¹ Perhaps both high and low scores are excuses for an action, ranging from

¹ It seems, therefore, that EFFORTLESS has two vectors of meaning illustrated by its placement on dimensions three and two. In the third dimension, it amounts to: done without exerting any purposeful effort, i.e., done without purposefully trying. In dimension two it means: easy to do.

"done because of some external reason" vs. "done unawares". Middle scores would then be terms that 'excuse' does not apply to.

It can be seen from Figures 4 to 6 that the different philosophers accord more importance to some one (or two) of the dimensions than to the others.¹ For example, Subject 1 gives little importance to either dimension 2 or dimension 3. By far the most important for this subject is dimension 1. On the other hand, Subject 9 accords little importance to dimension 2, somewhat more to dimension 1, and by far the most to dimension 3. Subject A accords approximately equal weight to all three dimensions. The two groups (indicated on the plots of Figures 4 to 6) consisting of Subjects 2,4,7 and Subjects 3,5,6,8 differ in that the latter views dimension 2 as more important than the former does (on the whole) and the former group views dimension 3 as more important than the latter group does (on the whole). This is most clearly shown in Figure 6.

From Figures 13 to 15 we can get a rough idea of the three dimensions which characterize the philosopher's semantic space for Science Terms. Dimension 1 ranks terms from a high THEORETICAL, lower for CONCEPTUAL and ANALYTIC, still lower for HYPOTHETICAL, A PRIORI and REGULAR; to a low EMPIRICAL, OBSERVABLE, GIVEN (and slightly less low CONTIN-

¹ Some readers might find the Table VI w-weightings more convenient to examine. Of course, the same information is carried in both this Table and these Figures.

GENT). Clearly, this primary dimension rates terms as to how much "inference" is involved, or how far removed from empirical, observable reality. Dimension 2 ranks A PRIORI, ANALYTIC very high, CONCEPTUAL slightly less high, NECESSARY, CONVENTIONAL, SUFFICIENT less, ESSENTIAL still less; it ranks LAWLIKE lowest, REGULAR, NATURAL, EMPIRICAL slightly higher, CONTINGENT, OBSERVABLE slightly higher, and PROBABLE still higher. This dimension seems to go from a high of "logically foundational" to a low of "empirically foundational". Those terms in the middle will be terms which are not foundational at all; on the negative side but in the middle will be non-foundational terms having to do with empirical matters (e.g., PROBABLE). Dimension 3 has NECESSARY very high, ESSENTIAL high, ANALYTIC, A PRIORI somewhat lower; it has HYPOTHETICAL, CONTINGENT very low, CONVENTIONAL and PROBABLE low, EMPIRICAL slightly higher. This dimension seems to be a measure of logical certainty attached to the term.

Again, it can be seen from Figures 7 to 9 (or alternatively, from Table VII) that different philosophers attach different importance to the different dimensions. For example, Subject 9 appears to attend only to dimension 2. Subject 3 attends mainly to dimension 1, and much less to dimension 3, still less to dimension 2. Subject 1 attends mainly to dimension 3, much less to dimension 1, and still less to dimension 2. Subject A attends about equally to all dimensions. (Subject A's normalized w-scores do not vary

well represent his actual ratings, as Table VIII shows. This suggests that a three-dimensional solution provides a poor fit for his data in this field.) The other groups indicated on these plots, 4,5,6 vs. 2,7,8, differ mainly on how much importance they attach to dimension 3.

The question naturally arises: why should we choose a three-dimensional solution over any other -- e.g., over a two-dimensional or four-dimensional solution? The answer to this can be put in terms of the correlation between the original ratings and the reconstructed ratings made on the basis of the low dimensional solution. If, in the Action Term case, every dimension were equally important, we would expect each of the 11 dimensions to contribute equally to the placement of the terms; i.e., we would expect each dimension to account equally for the variance and correlations. Instead, the first dimension accounts for most, the second dimension for next most, etc. When we reach a point where the addition of a dimension does not add more information (improve correlation) than would be expected by chance, then we say we have an optimum solution. Thus, we get a rough estimate as to whether we have an optimum solution in n dimensions by considering whether adding the $(n+1)$ st dimension accounts for more of the improved correlation than one expects by chance addition of another dimension. What do we expect from a chance addition of a dimension? For the Action Terms, given a solution in n dimensions with a correlation of r , we expect each of the

remaining $11-n$ dimensions to account equally for the $1-r$ correlation not yet accounted for, i.e., for $(1-r)/(11-n)$. Our three dimensional solution for Action Terms has a correlation of 0.796, so if none of the higher dimensions are important, we would expect that they each would contribute $0.204/8 (=0.025)$ improvement in correlation. So, we expect an unimportant fourth dimension to have an average correlation of 0.821. The four dimensional solution was done and it in fact has an average correlation between the original data and the reconstructed data of 0.823 (see Table IX). We therefore judge that the addition of a fourth dimension to a solution is not important. Similar reasoning tells us that the third dimension is important. From Table IX we see that the correlation between the original scores and the reconstructed scores for the two dimensional solution is 0.704, so if a third dimension is not important, we would expect it to contribute $0.296/9 (=0.033)$. That is, we would expect a three dimensional solution to have a correlation of 0.737. However, the three dimensional solution has in fact a correlation of 0.796, and so we consider the third dimension to be important. Carrying the same reasoning over to the Science Terms, the three dimensional solution correlates 0.696, so we expect each higher dimension to add $0.304/17 (=0.018)$, so we expect a four dimensional solution to correlate 0.714. In fact, as Table IX shows, it correlates at 0.725. A case can perhaps be made out for this being of some importance (the

distribution properties of the MDS and INDSCAL correlations are not known), but we view it as not of interest and stay with a three dimensional maximum.¹ The two dimensional solution correlates 0.607, so we expect the higher dimensions to contribute $0.393/18 (=0.022)$ to the correlation, so we expect the three dimensional solution to correlate 0.629. The fact that it correlates 0.696 shows that the third dimension is important.

Table IX: Average Correlations Between Original Scores and Reconstructed Scores in Different Dimensional Solutions (Philosophers)

<u>No. Dimensions</u>	<u>Action</u>	<u>Science</u>
4	0.823	0.725
3	0.796	0.696
2	0.704	0.607

HCP for the Philosophers

The normalized w-weightings give us information about how important each subject views each dimension (in comparison with the other subjects). We might therefore try to group subjects according to how much alike they are in their perception of the similarity of these dimensions. For this end, the three-dimensional w-weightings of the philosophers

¹ In fact, this highly improved correlation comes mainly from an improvement in Subject A's correlation (from 0.442 to 0.545).

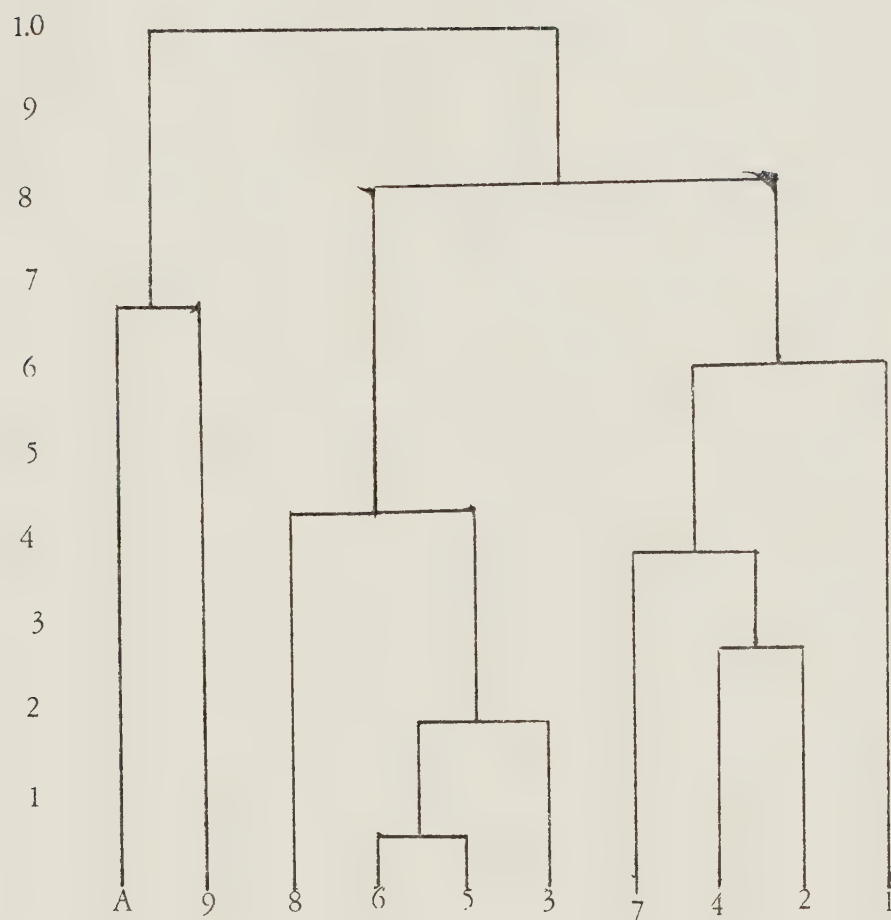


Figure 16: HCP Analysis of Philosophers on Action Terms.

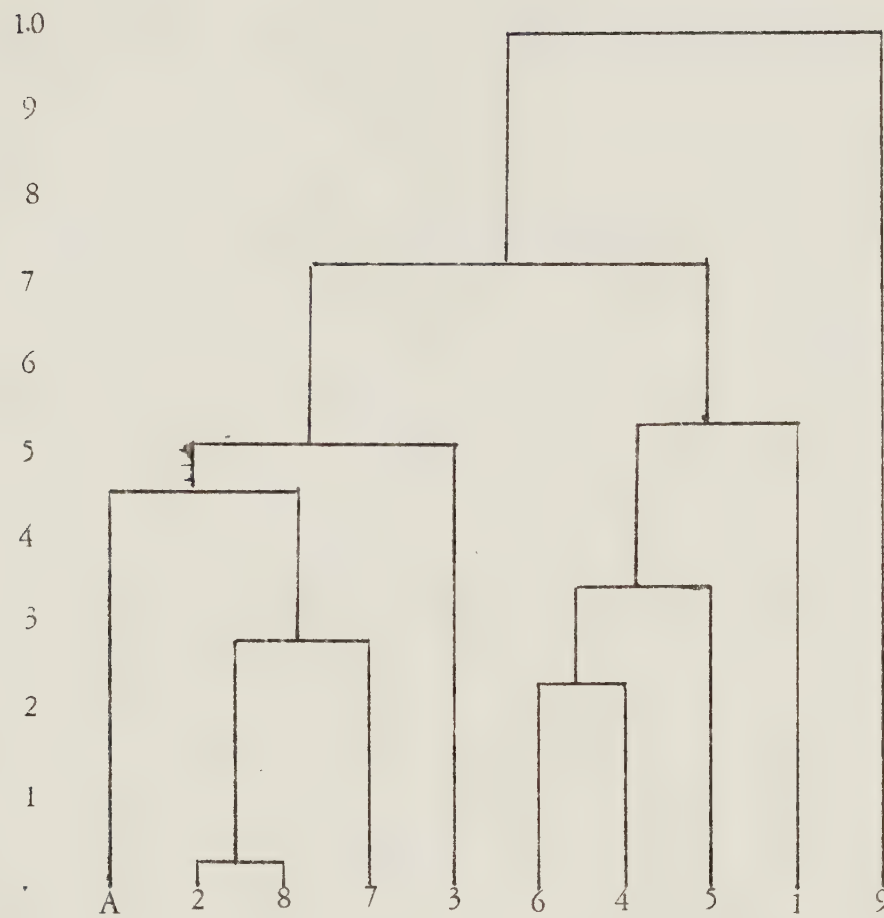


Figure 17: HCP Analysis of Philosophers on Science Terms.

for each semantic field were entered as data for a hierarchical clustering program (HCP). The results (diameter method) are presented as Figures 16 and 17. It should be noted that the program forces a grouping regardless of how much "error" is introduced. For Figure 16 we should consider two possible solutions as to how many groups of philosophers there are for the Action Terms. The first solution would be to consider these groups: {A}, {9}, {3,5,6,8}, {2,4,7}, {1}. The second solution would be to consider these groups: {9,A}, {3,5,6,8}, {1,2,4,7}. Table X gives the error scores (measure of within-group variance introduced) for the successive groupings. It will be noted that the attempt to form four groups (by adding Subject 1 to {2,4,7}) makes the error score jump from 0.195 to 0.300; the attempt to form two groups (by adding {1,2,4,7} to {3,5,6,8}) makes the error score jump from 0.349 to 0.470. For Figure 17 we should consider these two solutions: there are six groups {A}, {9}, {2,7,8}, {4,5,6}, {3}, {1}; or there are three groups {2,3,7,8,A}, {1,4,5,6}, {9}. The attempt to form five groups (by joining subject A to {2,7,8}) makes the error score jump from 0.189 to 0.287; the attempt to form two groups (by joining {2,3,7,8,A} to {1,4,6}) makes the error score jump from 0.361 to 0.573, as Table XI shows. These groups are the ones which have been indicated by concentric closed figures in Figures 4 to 9. The fact that these figures are "well defined" -- without discontinuities and relatively simple -- shows that the

Table X: Error Scores for Successive Groupings of Philosophers on Action Terms

<u>Groups Formed</u>	<u>Error Score</u>
{5,6}	0.018
{3,5,6}	0.064
{2,4} {3,5,6}	0.108
{2,4,7} {3,5,6}	0.163
{2,4,7} {3,5,6,8}	0.195
{1,2,4,7} {3,5,6,8}	0.299
{1,2,4,7} {3,5,6,8} {9,A}	0.349
{1,2,3,4,5,6,7,8} {9,A}	0.470
{1,2,3,4,5,6,7,8,9,A}	0.595

Table XI: Error Scores for Successive Groupings of Philosophers on Science Terms

<u>Groups formed</u>	<u>Error Score</u>
{2,8}	0.010
{4,6} {2,8}	0.107
{4,6} {2,7,8}	0.145
{4,5,6} {2,7,8}	0.189
{4,5,6} {2,7,8,A}	0.287
{4,5,6} {2,3,7,8,A}	0.345
{1,4,5,6} {2,3,7,8,A}	0.361
{1,2,3,4,5,6,7,8,A}	0.573
{1,2,3,4,5,6,7,8,9,A}	0.950

INDSCAL and HCP analyses support one another.¹

What are the groups indicated by the HCP? Is there any reason to choose either the five-group or three-group solution over the other (for Action Terms)? Is there any reason to choose either the six-group or the three-group solution over the other (for Science Terms)? Let us start

¹ The apparent overlap of clusters (e.g., in Figure 4) and apparent non-simple shapes (e.g., in Figure 7) are due merely to these figures being two-dimensional projections of the three-dimensional data. For confirmation of this, compare the other two-dimensional projections -- Figures 5 and 6 (for Figure 4) and Figures 8 and 9 (for Figure 7).

this discussion by a consideration of the Action Terms. One rather interesting feature of this study is that action theory is a (central) branch of the philosophy of mind, and a number of our philosophers have as their field of specialization the philosophy of mind. In fact, the group {1,2,4,7} of the three-group solution is precisely those philosophers. This is certainly a reason for preferring the three-group solution. But what of the five-group solution? This solution separates {1} from {2,4,7} -- a feature which becomes understandable when one notices that Subject 1 has had some training in Continental philosophy. It therefore seems that more-or-less uniform training in a field (here: philosophy of mind) will cause people to perceive semantic elements from that field in the same way as one another; and that moderate differences in training (e.g., Continental philosophy superimposed on Analytic philosophy of mind) will cause perturbations in this perception.

What of the other philosophers? The three-group solution joins {9,A}, both of whom have philosophy of religion as an area of specialization. We might note in passing that many of the terms of action theory (e.g., FREE, INADVERTENT, UNCAUSED, etc.) have special uses in philosophy of religion, and it is this which perhaps accounts for why {9,A} are separate from the others {3,5,6,8}. The five-group solution separates Subjects 9 and A; this is perhaps a recognition that Subject A does, but Subject 9 does not, have other specializations. Both solutions form the group

{3,5,6,8}. This group consists of analytic philosophers whose specialization is neither philosophy of mind nor philosophy of religion. It therefore seems that the three group solution is preferable, since it is more easily interpreted, and since there is a natural way to interpret and understand the five-group solution in terms of the three-group one.

It furthermore seems to follow from my analysis of the Action Terms that a general training in a field (as all analytic philosophers have some general training in philosophy of mind) when not augmented by specific training in that field or in some field which also uses the concepts of that field (as philosophy of religion uses some of the terms used in philosophy of mind), will produce a homogeneous group regardless of any other differences within this group. Thus, for example, the members of the group {3,5,6,8} have specialities as distinct as Marxism and Mediaeval philosophy, or as philosophy of language and aesthetics, yet their common, very general training in philosophy of mind directs them into a single group; and this group is distinct from that group of philosophers who specialize in philosophy of mind, even though individual philosophers chosen from the two groups may have other specializations which are identical (e.g., philosophy of language).

The explanation of the results of the Science Terms is not to be organized in the same way as that of the Action

Terms, because none of the philosophers has philosophy of science as one of their specialities, and only three of the subjects (2, 7, and 8) reported any training at all in the field.¹ Instead, we view it as a method of discovering "accidental" sameness of training among people who have no special or general training in the area (except that we might predict 2, 7, and 8 to form a group). In fact, in the six-group solution {2,7,8} do form a group, thus confirming the conclusions formed on the basis of the analysis of the Action Terms. In this six-group solution, the only other non-singleton group is {4,5,6}. There is no obvious reason why these subjects should form a group. There is also no obvious reason why Subjects 3 and A should group with {2,7,8} in the three-group solution, nor why Subject 1 should group with {4,5,6}, nor why Subject 9 should not cluster with some other group. I take this to be a discovery that hidden and unexpected factors can bring about difference or similarity of subjective semantic networks even when some overt factors might suggest otherwise. (E.g., Subjects 3 and 5 both have aesthetics as a speciality, but they fall in different groups; and Subjects 4, 5, and 6 group together even though they have no field in

¹ Unlike philosophy of mind, philosophy of science is not a field that every analytic philosopher will have some training in during his graduate career. All analytic philosophers must take a comprehensive examination in a field which includes philosophy of mind, but philosophy of science is viewed as an "optional field" in present-day analytic graduate schools.

common) .

INDSCAL for Students

The common low-dimensionality space (here: three dimensions) generated by the students for the Action Terms can be reconstructed from the x-weightings of the terms (in three dimensions) as given in Table XII. Figures 18 to 20 are a pictorial representation of this data, i.e., a

Table XII: x-weightings of Action Terms for Students.

<u>Term</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1 ACCIDENTAL	+0.292	-0.093	-0.036
2 CAUSED	+0.099	+0.513	+0.033
3 COMPELLED	-0.047	+0.229	-0.352
4 DETERMINED	-0.401	-0.105	+0.546
5 EFFORTLESS	-0.295	-0.329	+0.436
6 FREE	-0.471	-0.156	+0.209
7 INADVERTENT	+0.404	-0.027	-0.003
8 INVOLUNTARY	+0.347	+0.290	+0.204
9 MECHANICAL	+0.113	-0.043	-0.414
A SPONTANEOUS	+0.120	+0.436	-0.209
B THOUGHTLESS	-0.315	-0.335	-0.202
C UNCAUSED	+0.153	-0.379	-0.212

placement of the Action Terms in their appropriate position in this common space. It can be seen that dimension 1 for Action Terms arranges the terms from a high CAUSED, DETERMINED, COMPELLED, less high for MECHANICAL; to a lowest ACCIDENTAL, less low for UNCAUSED, INADVERTENTLY, INVOLUNTARY. Dimension 2 arranges the terms from a high INVOLUNTARY, COMPELLED, less high MECHANICAL; to a low FREE, SPONTANEOUS, less low UNCAUSED, EFFORTLESS. Dimension 3



Figure 18: INDSCAL Analysis: Action Terms Placed in Common Action Term Word Space (Students), Dimensions 1 vs. 2.

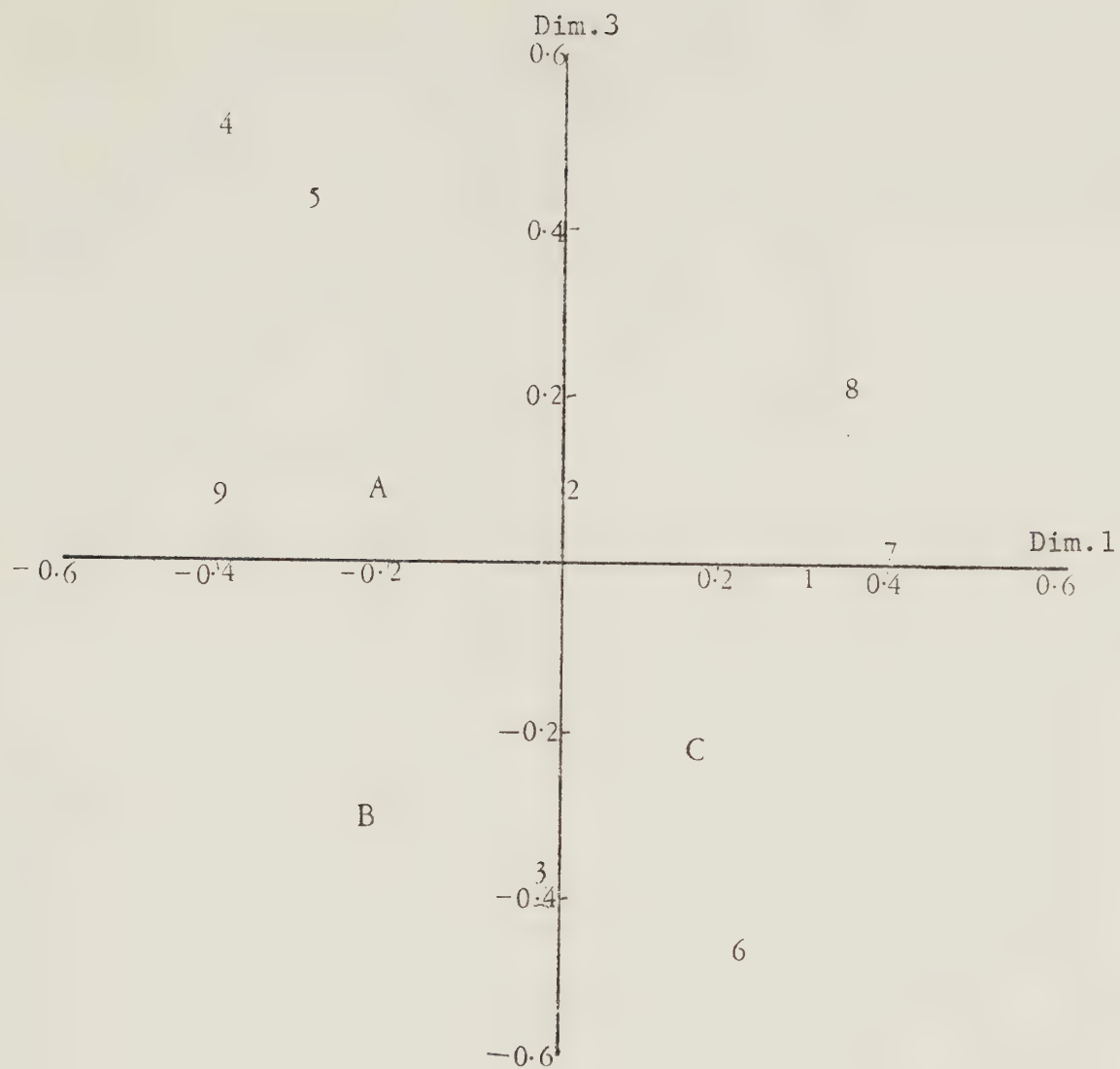


Figure 19: INDSCAL Analysis: Action Terms Placed in Common Action Term Word Space (Students), Dimensions 1 vs. 3.

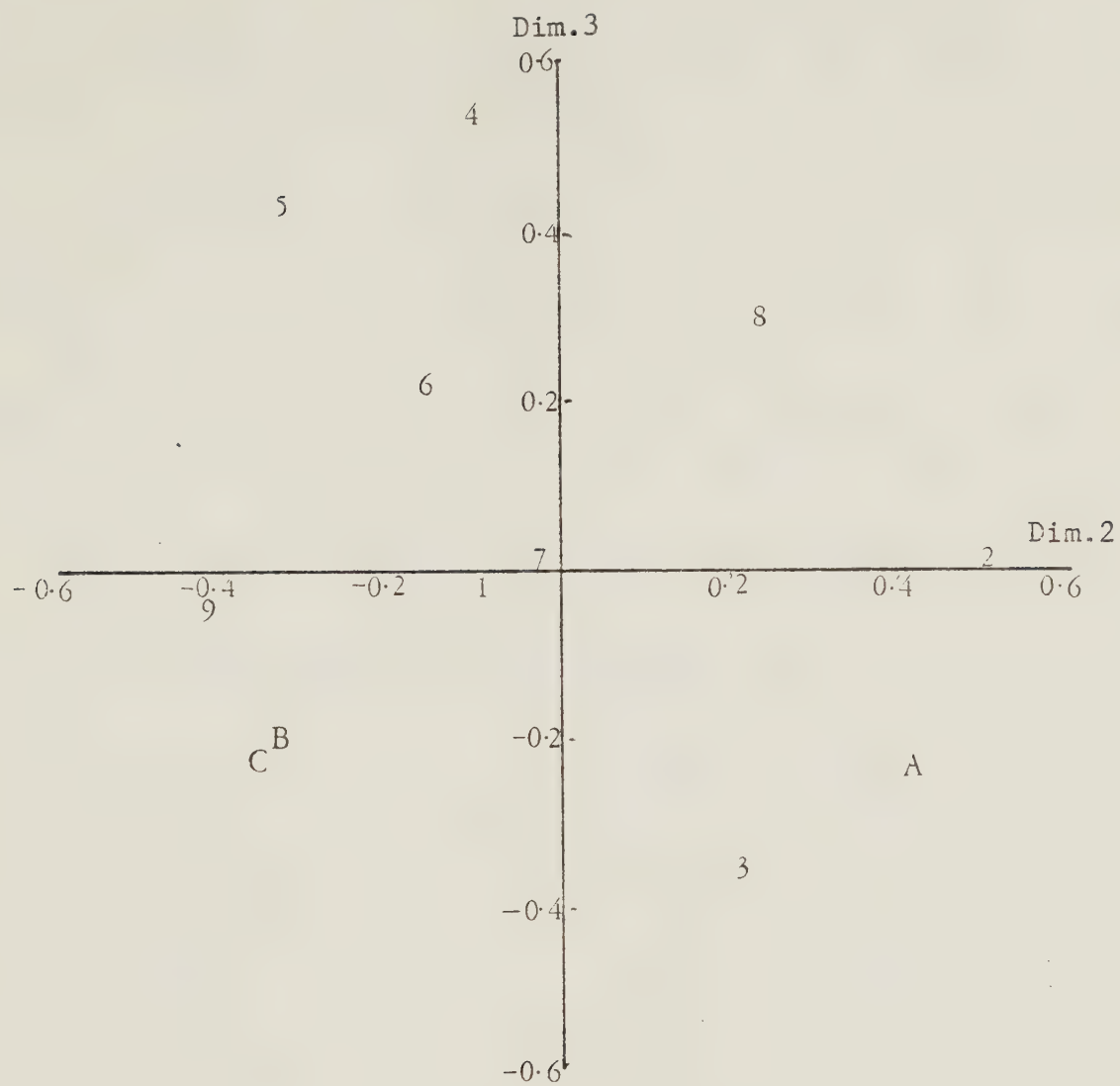


Figure 20: INDSCAL Analysis: Action Terms Placed in Common Action Term Word Space (Students), Dimensions 2 vs. 3.

arranges the terms from a high THOUGHTLESS, MECHANICAL, less high for EFFORTLESS, INADVERTENTLY; to a low DETERMINED, COMPELLED, less low FREE, UNCAUSED. It is extremely difficult to label these dimensions (but see Table XVI below).

The x-weightings of the Science Terms (in three dimensions) are given in Table XIII. From these we construct the pictorial representation of Figures 21-23: a placement of

Table XIII: x-weightings of Science Terms for Students.

<u>Term</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1 ANALYTIC	-0.085	-0.174	+0.447
2 A PRIORI	-0.279	+0.316	-0.007
3 CONCEPTUAL	+0.037	-0.317	-0.219
4 CONTINGENT	+0.151	-0.019	+0.379
5 CONVENTIONAL	+0.399	+0.198	-0.067
6 EMPIRICAL	+0.181	-0.140	+0.095
7 ESSENTIAL	-0.029	+0.424	-0.027
8 GIVEN	-0.326	+0.140	-0.076
9 HYPOTHETICAL	-0.213	+0.295	+0.058
A LAWLIKE	-0.046	-0.229	+0.494
B NATURAL	-0.135	-0.293	-0.167
C NECESSARY	-0.145	-0.075	-0.195
D OBJECTIVE	+0.453	+0.218	-0.059
E OBSERVABLE	-0.059	-0.116	+0.126
F PROBABLE	-0.174	+0.083	-0.056
G REASONABLE	-0.233	+0.029	-0.078
H REGULAR	+0.434	+0.244	-0.069
I SUFFICIENT	+0.009	-0.255	+0.197
J THEORETICAL	-0.082	-0.283	-0.261
K TRUE	+0.012	+0.029	-0.238
L VALID	+0.129	-0.073	-0.279

the Science Terms in the common Science Terms word space for students. It can be seen that dimension 1 arranges the terms from a high for HYPOTHETICAL, THEORETICAL, CONCEPTUAL;

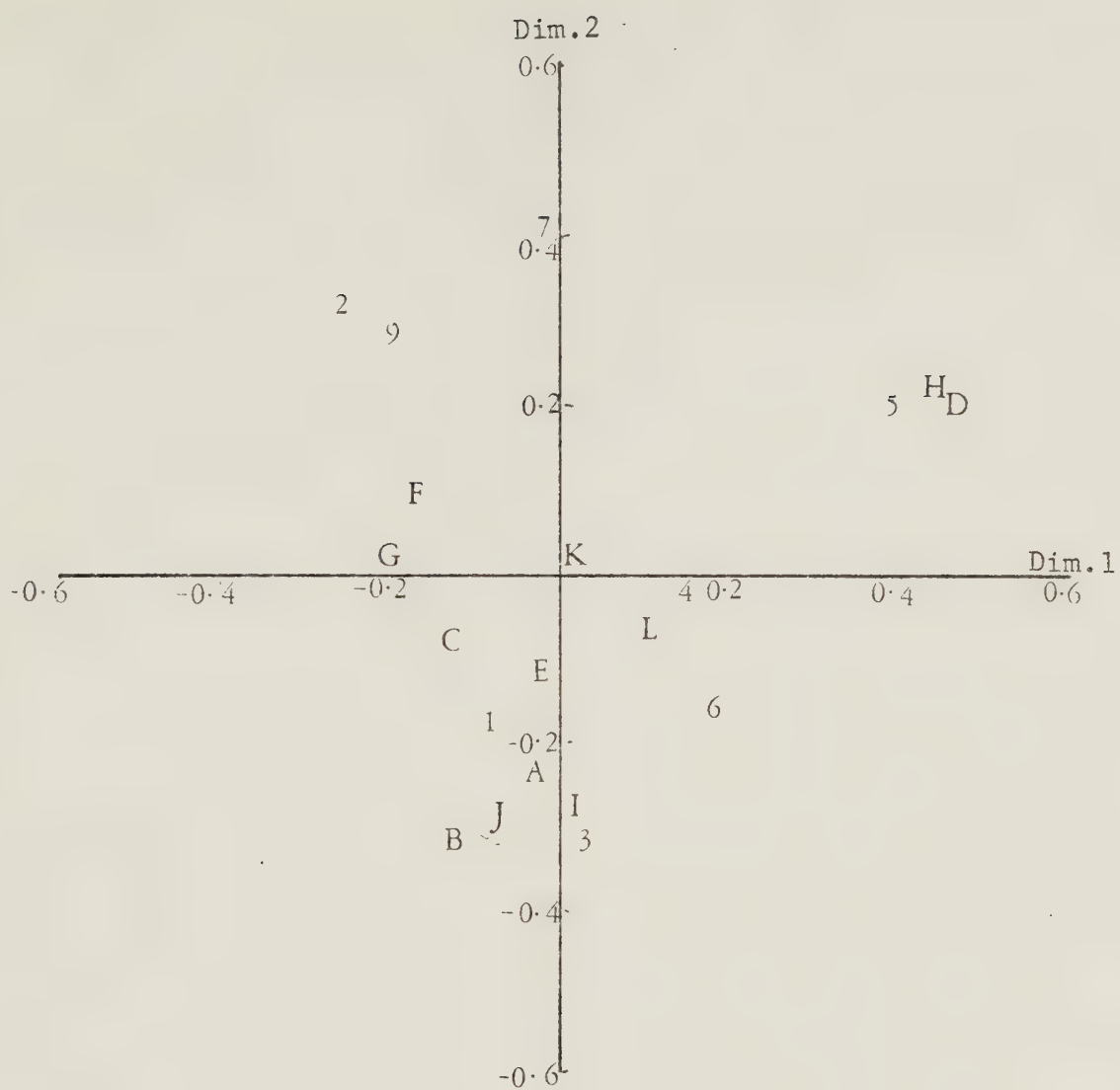


Figure 21: INDSCAL Analysis: Science Terms Placed in Common Science Terms Word Space (Students), Dimensions 1 vs. 2.

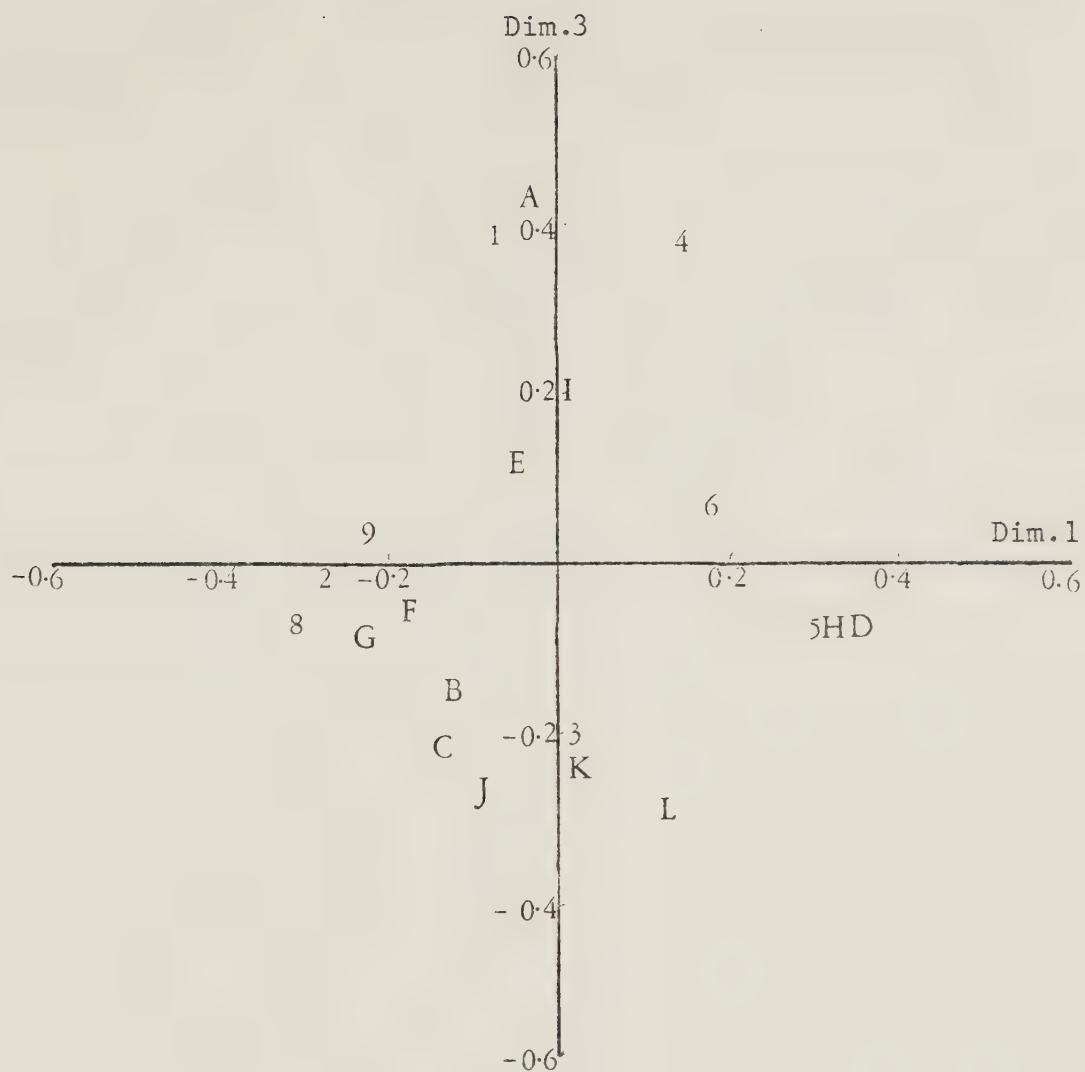


Figure 22: INDSCAL Analysis: Science Terms Placed in Common Science Term Word Space (Students), Dimensions 1 vs. 3.

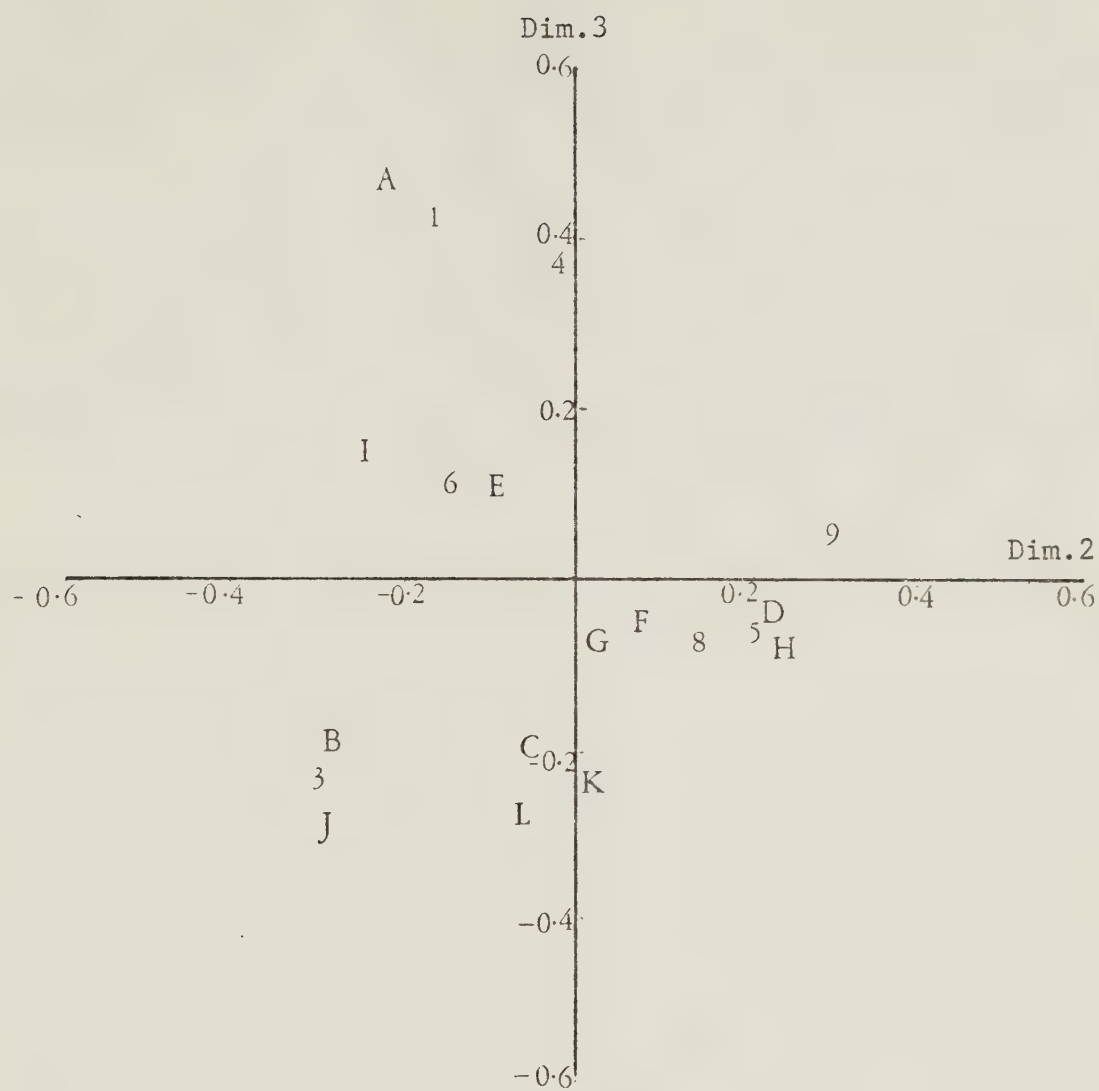


Figure 23: INDSCAL Analysis: Science Terms Placed in Common Science Term Word Space (Students), Dimensions 2 vs. 3.

to a low for OBSERVABLE, EMPIRICAL, slightly less low for TRUE, OBJECTIVE, and less low for VALID, NATURAL, LAWLIKE. Such an arrangement of terms suggests that the dimension is one measuring "how settled" the proposition to which the term is applied is. (That this is different from the philosophers' dimension 1 can be seen by noting the presence of TRUE, VALID in the low range of the students' dimension. Their absence from the philosophers' end-regions presumably means that the concepts of true and valid can be applied anywhere along the dimension -- whether it be to a theoretical proposition (high end) or to an empirical proposition (low end). But since these terms characterize only one end of the students' scale, their first dimension cannot be the same as the philosophers': They are characterizing a slightly different vector of meaning of these terms. See Table XVII below.) Dimension 2 arranges the terms from high ANALYTIC, EMPIRICAL, less high OBJECTIVE, HYPOTHETICAL, THEORETICAL; to a low CONVENTIONAL, NATURAL, REGULAR, less low NECESSARY, GIVEN, ESSENTIAL. This dimension seems to be one which judges whether propositions so characterized are true as a matter of logic or science (high) vs. those that are known to be true as a part of everyday life as given by common wisdom. If this is so, then CONVENTIONAL should be taken as "usual" or "accepted by everyone", and REGULAR should be taken as "common", rather than taking the terms in their more usual philosophical way. The third dimension arranges the terms from a high NECESSARY, ESSENTIAL,

CONTINGENT to a low PROBABLE, REGULAR, REASONABLE, less low for CONVENTIONAL, NATURAL, LAWLIKE. This dimension is difficult to interpret.

The w-weightings of the students for the Action Terms and the Science Terms are given by Tables XIV and XV respectively. The placement of the students in the common Action Term space is shown in Figures 24-26 and their placement in the common Science Term space is shown in Figures 27-29. A HCP was run on the w-weightings of the students (see Figures 30-31) and the results superimposed on Figures 24-29. It can be seen that, depending upon the "strictness" of group formation allowed, there are either 5 or 3 groups for the Action Terms and either 6 or 3 groups for the Science Terms. (However, Student E forms one of the 3-groups by himself in the Science Terms; since there are so many students studied that one would expect every subject to group with some others, we might for this reason wish to exclude Student E and claim that there are either 5 or 2 groups.)

A comparison of the philosophers' three dimensions of meaning and the students' three dimensions of meaning is given in Table XVI for Action Terms and in Table XVII for the Science Terms.

MDS Analysis of Typical Philosophers

One problem with the preceding INDSCAL analyses of the philosophers' and students' dimensions of meaning is that it

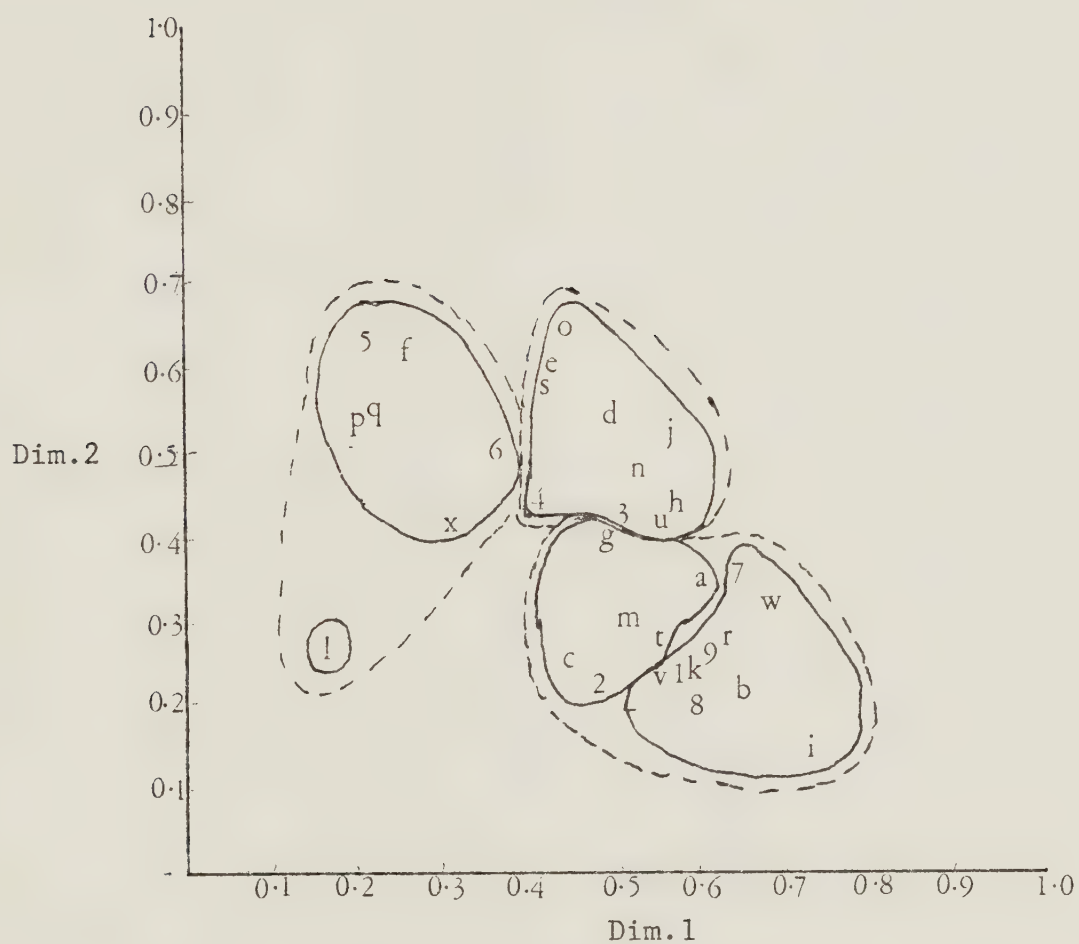


Figure 24: INDSCAL Analysis: Students in Common Action Term Word Space, Dimensions 1 vs. 2. 5-group HCP solution in solid outline, 3-group solution in broken outline.

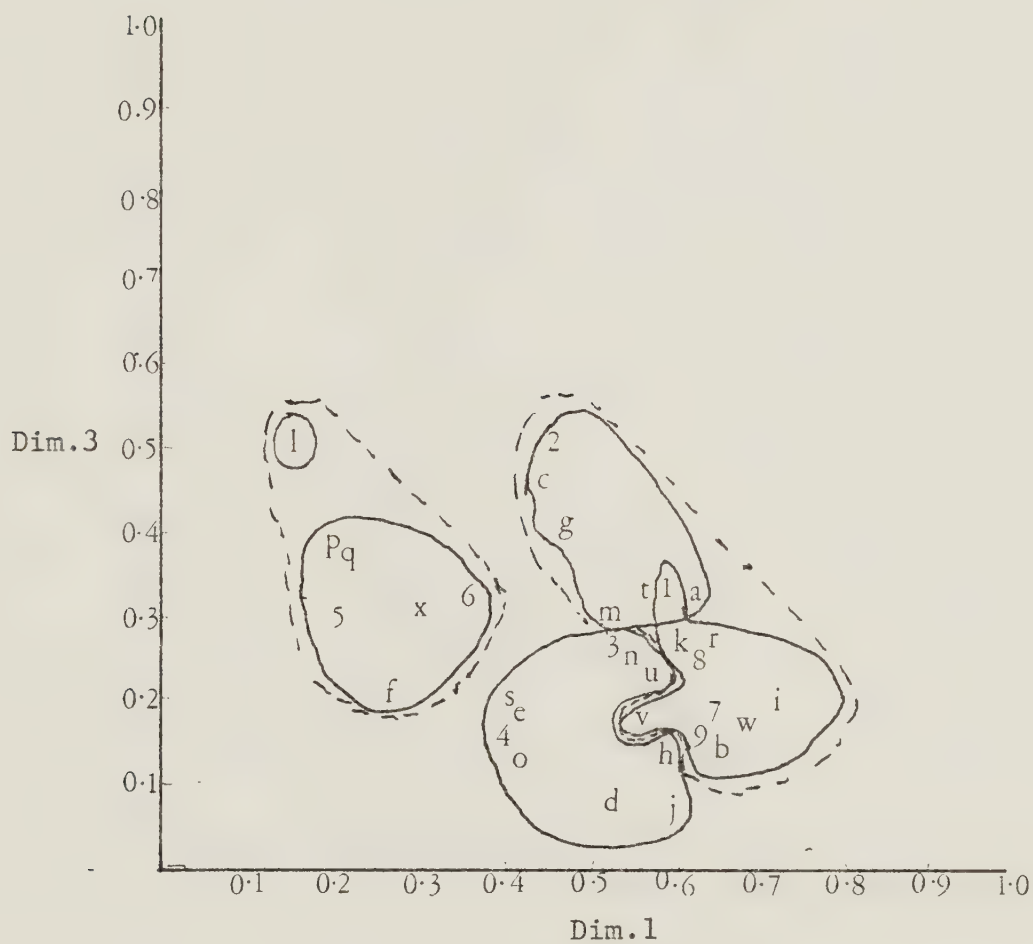


Figure 25: INDSCAL Analysis: Students in Common Action Term Word Space, Dimensions 1 vs. 3. 5-group solution in solid outline. 3-group solution in broken outline.

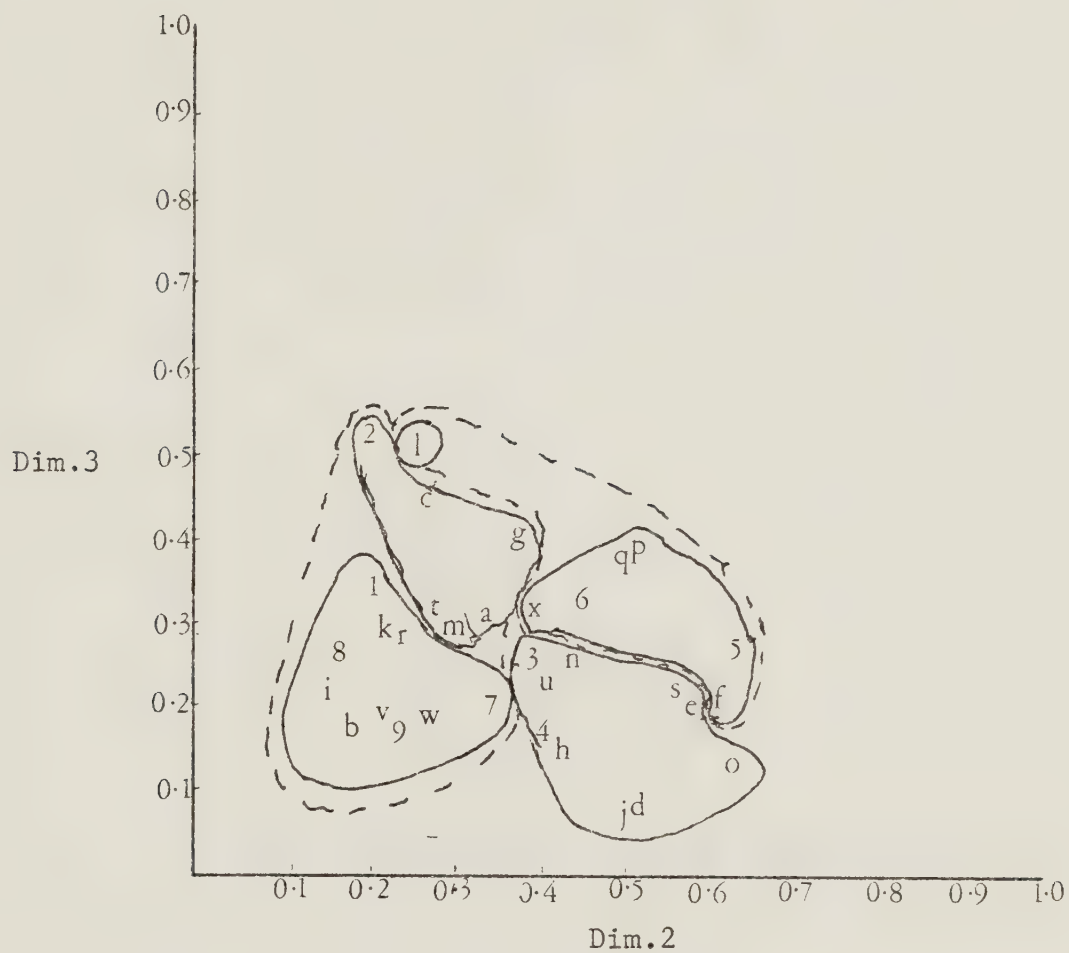


Figure 26: INDSCAL Analysis: Students in Common Action Term Word Space, Dimension 2 vs. 3. 5-group solution HCP in solid outline. 3-group solution in broken outline.

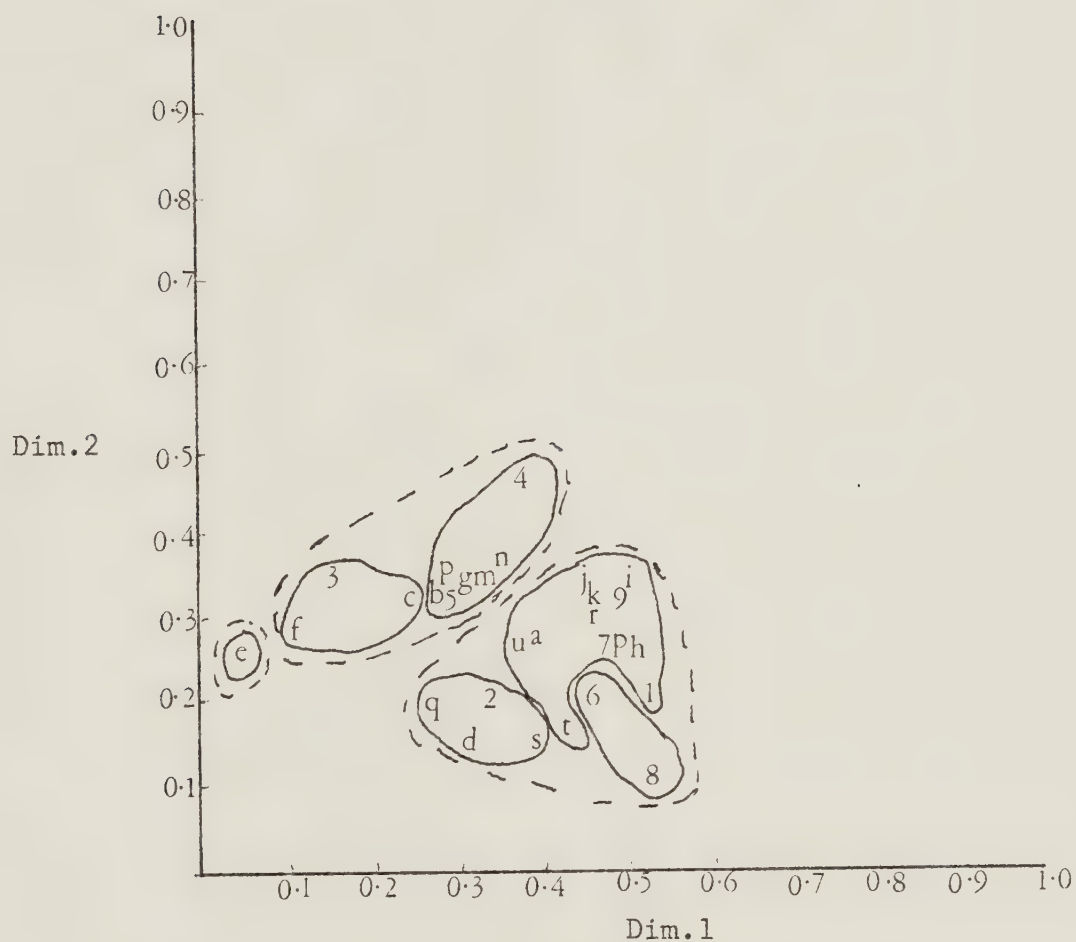


Figure 27: INDSCAL Analysis: Students in Common Science Term Word Space, Dimension 1 vs. 2. 6-group HCP solution in solid outline. 3-group solution in broken outline.

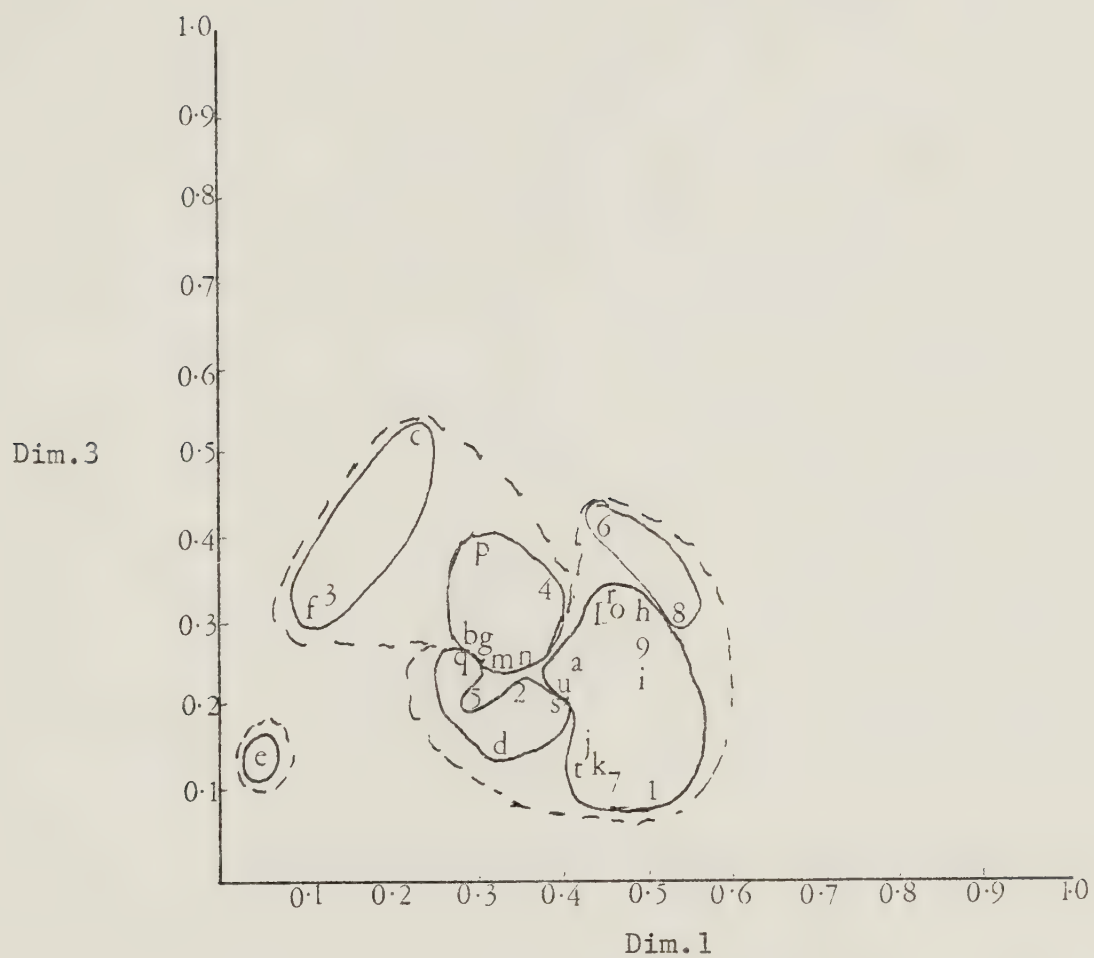


Figure 28: INDSCAL Analysis: Students in Common Science Term Word Space, Dimensions 1 vs. 3. 6-group HCP solution in solid outline. 3-group solution in broken outline.

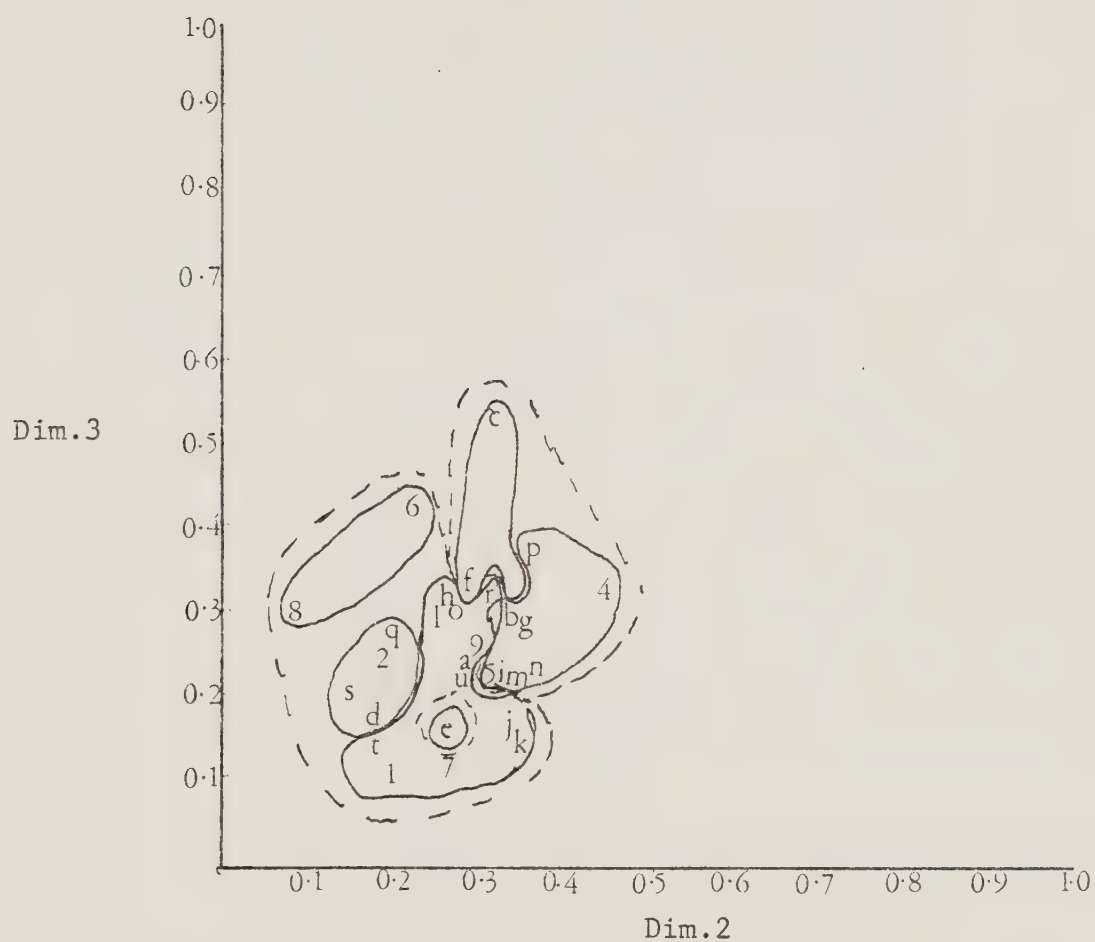


Figure 29: INDSCAL Analysis: Students in Common Science Term Word Space, Dimensions 2 vs. 3. 6-group solution HCP in solid outline. 3-group solution in broken outline.

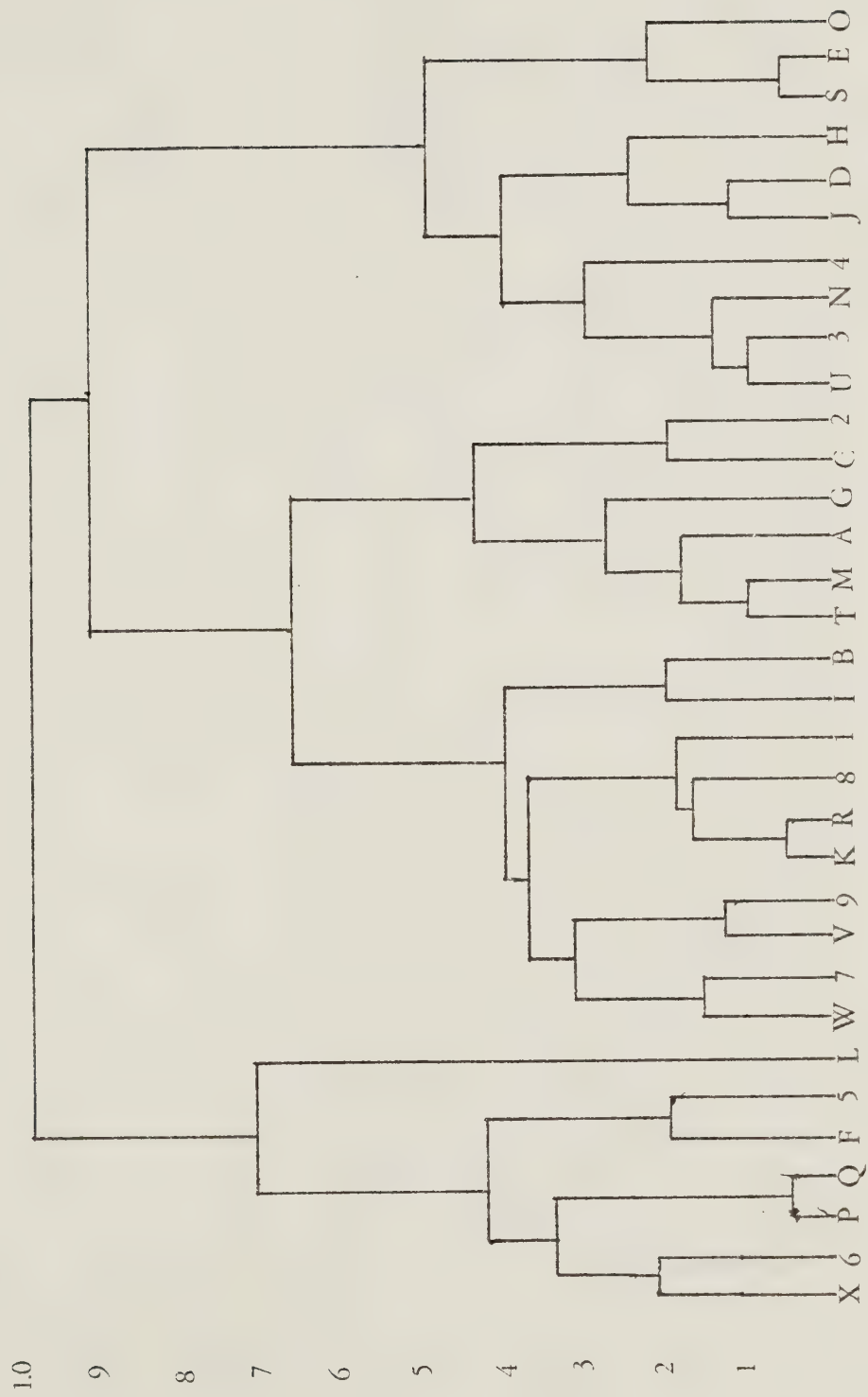


Figure 30: HCP Analysis of Students for Action Terms (Diameter Method).

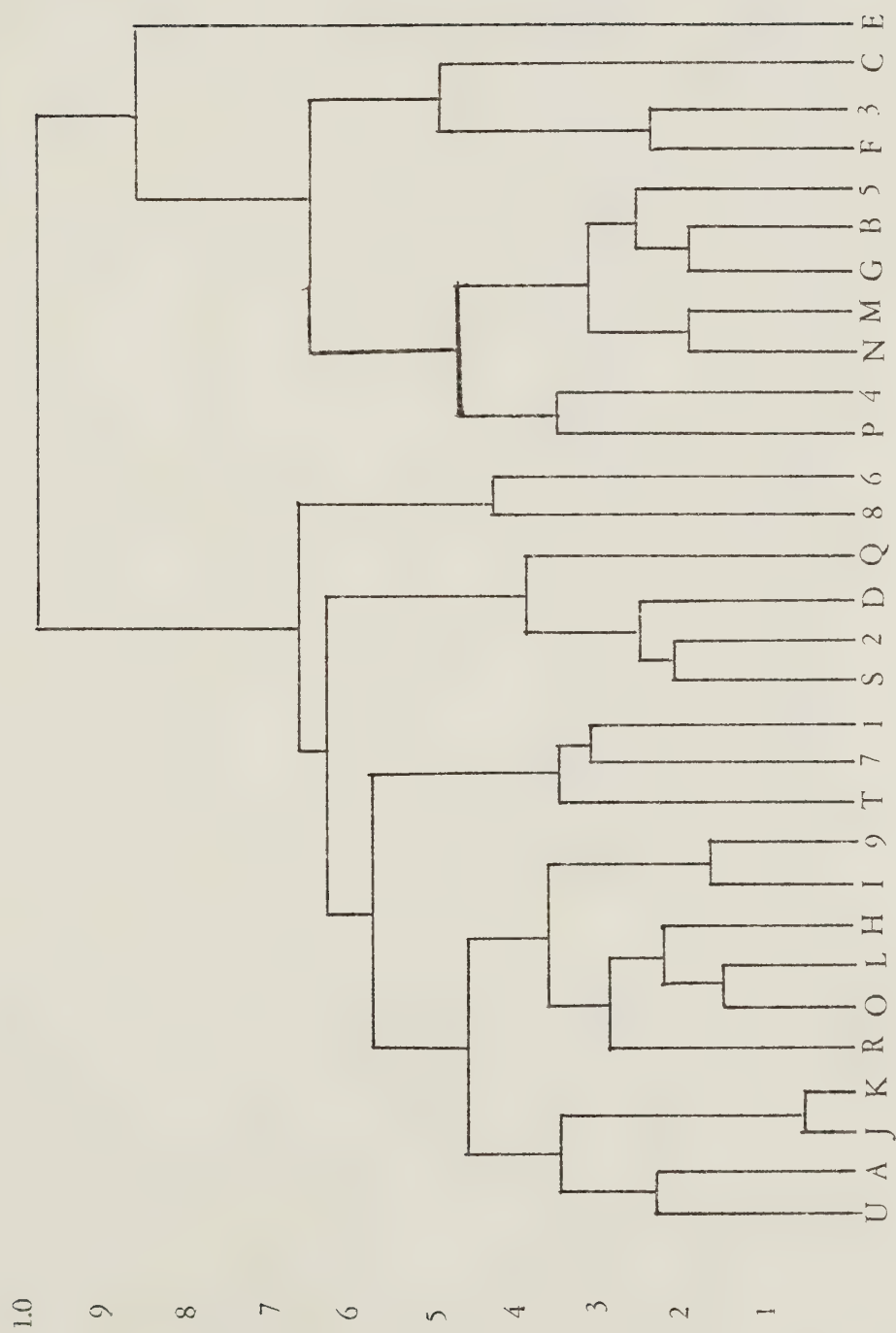


Figure 31: HCP Analysis of Students for Science Terms (Diameter Method).

Table XIV: w-weightings of Students for Action Terms.

<u>Subject</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1	0.577	0.207	0.336
2	0.470	0.222	0.510
3	0.520	0.396	0.263
4	0.413	0.425	0.169
5	0.215	0.620	0.290
6	0.364	0.481	0.309
7	0.642	0.355	0.198
8	0.601	0.171	0.260
9	0.611	0.241	0.167
A	0.600	0.336	0.318
B	0.651	0.183	0.149
C	0.449	0.271	0.443
D	0.506	0.516	0.084
E	0.431	0.594	0.199
F	0.258	0.618	0.210
G	0.487	0.384	0.393
H	0.577	0.442	0.150
I	0.732	0.150	0.198
J	0.575	0.501	0.077
K	0.587	0.219	0.278
L	0.162	0.256	0.501
M	0.524	0.299	0.299
N	0.536	0.463	0.249
O	0.439	0.629	0.134
P	0.203	0.513	0.382
Q	0.205	0.510	0.381
R	0.630	0.247	0.272
S	0.423	0.561	0.218
T	0.561	0.271	0.332
U	0.563	0.414	0.233
V	0.554	0.216	0.183
W	0.685	0.288	0.182
X	0.304	0.409	0.299

does not quite prove the strong claim that different people might have entirely different dimensions of meaning. For, the INDSCAL technique (like any statistical technique) makes certain assumptions about the source of the data. Of interest here is INDSCAL's assumption that every subject has access to the same dimensions, and it then goes on to measure the salience of each of these dimensions for each

Table XV: w-weightings of Students for Science Terms.

<u>Subject</u>	<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
1	0.516	0.203	0.112
2	0.349	0.186	0.226
3	0.144	0.339	0.340
4	0.375	0.450	0.328
5	0.296	0.334	0.219
6	0.446	0.215	0.407
7	0.458	0.259	0.132
8	0.543	0.112	0.318
9	0.485	0.311	0.258
A	0.417	0.295	0.254
B	0.284	0.328	0.292
C	0.227	0.319	0.504
D	0.341	0.169	0.157
E	0.049	0.250	0.140
F	0.119	0.291	0.333
G	0.310	0.350	0.282
H	0.504	0.258	0.316
I	0.491	0.329	0.230
J	0.435	0.337	0.155
K	0.435	0.337	0.155
L	0.452	0.250	0.294
M	0.336	0.355	0.234
N	0.351	0.387	0.245
O	0.472	0.254	0.313
P	0.298	0.357	0.373
Q	0.277	0.198	0.264
R	0.452	0.315	0.321
S	0.391	0.151	0.198
T	0.427	0.170	0.148
U	0.392	0.285	0.215

subject. But we would like to show that they are not even aware of the same dimensions. For this end, we should look at the MDS analyses of individual philosophers and compare their dimensions of meaning. (Admitting, of course, that these will be very gross comparisons, as there is no recognized statistical test to be used in such comparisons between separate MDS analyses. Nonetheless, there are such striking differences among our philosophers that these intuitive comparisons will carry considerable weight.)

Table XVI: A Comparison of the Philosophers' and Students Dimensions of Meaning for Action Terms.

<u>Philosophers</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
COMPELLED	FREE	UNCAUSED
DETERMINED	EFFORTLESS	
CAUSED	SPONTANEOUS	COMPELLED
MECHANICAL	CAUSED	DETERMINED
.	.	.
.	.	.
.	.	.
.	.	.
ACCIDENTAL	INADVERTENTLY	EFFORTLESS
	UNCAUSED	ACCIDENTAL
UNCAUSED	THOUGHTLESS	
SPONTANEOUS	ACCIDENTAL	INADVERTENTLY
FREE	INVOLUNTARY	THOUGHTLESS

Dimension 1: "Necessitation"

Dimension 2: "Purposefulness of human actions"

Dimension 3: "Out of one's control for an external reason
vs. in one's control but not attended to"
or maybe "Excused for some external reason
vs. excused because it was done unawares"

<u>Students</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
CAUSED	INVOLUNTARY	THOUGHTLESS
DETERMINED	COMPELLED	MECHANICAL
COMPELLED		EFFORTLESS
MECHANICAL	MECHANICAL	INADVERTENTLY
.	.	.
.	.	.
.	.	.
.	.	.
INVOLUNTARY		
INADVERTENTLY	UNCAUSED	UNCAUSED
UNCAUSED	EFFORTLESS	FREE
	SPONTANEOUS	COMPELLED
ACCIDENTAL	FREE	DETERMINED

Note: High Dim.1 to low Dim.2 is the same as Philosophers' Dim.1.

Dim.3 is the same as Philosophers' Dim.3 (inverse).

Table XVII: A Comparison of Philosophers' and Students' Dimensions of Meaning for Science Terms.

<u>Philosophers</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
THEORETICAL	A PRIORI	NECESSARY
	ANALYTIC	ESSENTIAL
CONCEPTUAL	CONCEPTUAL	ANALYTIC
ANALYTIC	NECESSARY	A PRIORI
HYPOTHETICAL	CONVENTIONAL	.
A PRIORI	SUFFICIENT	.
REGULAR	.	.
.	.	.
.	.	.
.	CONTINGENT	.
.	OBSERVABLE	EMPIRICAL
.	EMPIRICAL	PROBABLE
CONTINGENT	NATURAL	CONVENTIONAL
	REGULAR	
GIVEN		CONTINGENT
OBSERVABLE	LAWLIKE	HYPOTHETICAL
EMPIRICAL		

Dimension 1: How far removed from empirical, observable reality.

Dimension 2: Logically foundational vs. empirically foundational.

Dimension 3: Amount of logical certainty attached.

<u>Students</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
HYPOTHETICAL	ANALYTIC	NECESSARY
THEORETICAL	EMPIRICAL	ESSENTIAL
CONCEPTUAL	OBJECTIVE	CONTINGENT
.	HYPOTHETICAL	.
.	THEORETICAL	.
.	.	.
.	.	.
LAWLIKE	.	.
NATURAL	ESSENTIAL	LAWLIKE
VALID	GIVEN	NATURAL
	NECESSARY	CONVENTIONAL
OBJECTIVE	REGULAR	REASONABLE
TRUE	NATURAL	REGULAR
EMPIRICAL	CONVENTIONAL	PROBABLE
OBSERVABLE		

Dimension 1: "How settled."

Dimension 2: Statements whose truth is a matter of logic or science vs. those that are a part of everyday life as given by common wisdom.

"Typical philosophers" are defined by their deep embeddedness in one of the groups given by the HCP (see Figures 16 and 17). Thus, for the Action Terms, Philosophers 5 and 6, Philosophers 2 and 4, and Philosophers 9 and A, will be typical. For the Science Terms, Philosophers 2 and 8, 4 and 6, and 9 will be typical. We pick one philosopher from each of these groups and use him to represent the group as a whole.¹ The individual MDS analyses of these philosophers' dimensions of meaning are given in Tables XVIII and XIX for the Action Terms and Science Terms respectively. It can be seen from Table XVIII that Philosophers 2 and 5 differ almost entirely in the fact that their third dimensions are different. In the discussion of Table XVI, the Philosophers' Dimensions of Meaning for Action Terms, Dimension 1 was called a measure of "Necessitation" and Dimension 2 was called a measure of the "Purposefulness of human actions". We here see that both philosophers 2 and 5 individually use these dimensions for their first two vectors of meaning in characterizing these terms. In Table XVI, the third dimension was disjunctively characterized as: "Out of one's control for an external reason vs. in one's control but not attended to" or maybe "Excusable for some external reason vs. excusable because it

¹ In fact, we ignore Philosopher 9 on Science Terms, since he is unique and so far distant from the others. Also, for reasons of ease of obtaining data, we use Philosopher 5 as a typical Science Term group instead of using 4 or 6. (As Figure 17 shows, he is quite close to 4 and 6).

Table XVIII: Dimensions of Meaning for Some Typical Philosophers (Action Terms).

<u>Philosopher 2</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
COMPELLED	DETERMINED	EFFORTLESS
INVOLUNTARY	FREE	.
MECHANICAL	CAUSED	.
DETERMINED	.	.
.	.	.
.	.	.
.	.	DETERMINED
SPONTANEOUS	UNCAUSED	
FREE	COMPELLED	MECHANICAL
UNCAUSED	INVOLUNTARY	UNCAUSED

<u>Philosopher 5</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
COMPELLED	CAUSED	SPONTANEOUS
CAUSED	FREE	EFFORTLESS
DETERMINED	EFFORTLESS	.
INVOLUNTARY	MECHANICAL	.
.	.	.
.	.	.
.	.	.
SPONTANEOUS	INVOLUNTARY	THOUGHTLESS
FREE	COMPELLED	INADVERTENT
UNCAUSED	UNCAUSED	ACCIDENTAL

<u>Philosopher A</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
COMPELLED	INADVERTENT	UNCAUSED
INVOLUNTARY	INVOLUNTARY	DETERMINED
DETERMINED	ACCIDENTAL	.
CAUSED	UNCAUSED	.
.	CAUSED	.
.	.	.
.	.	.
.	.	EFFORTLESS
ACCIDENTAL	MECHANICAL	ACCIDENTAL
UNCAUSED	DETERMINED	INADVERTENT
FREE	FREE	THOUGHTLESS

Philosophers 2 and 5 differ almost entirely in their third dimensions.

Philosopher A has a third dimension more like 2's than like 5's.

Philosopher A's second dimension differs from both 2's and 5's.

Table XIX: Dimensions of Meaning for Typical Philosophers
(Science Terms).

<u>Philosopher 5</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
ANALYTIC	HYPOTHETICAL	PROBABLE
NECESSARY	THEORETICAL	
A PRIORI	.	
CONCEPTUAL	.	LAWLIKE
ESSENTIAL	.	ESSENTIAL
.	.	.
.	.	.
.	.	OBJECTIVE
.	.	CONTINGENT
.	LAWLIKE	VALID
PROBABLE	OBJECTIVE	ANALYTIC
EMPIRICAL	NECESSARY	
CONTINGENT	OBSERVABLE	CONVENTIONAL

<u>Philosopher 8</u>		
<u>Dim.1</u>	<u>Dim.2</u>	<u>Dim.3</u>
CONCEPTUAL	REGULAR	HYPOTHETICAL
A PRIORI	THEORETICAL	
ANALYTIC	SUFFICIENT	
THEORETICAL	LAWLIKE	CONTINGENT
.	HYPOTHETICAL	VALID
.	.	TRUE
.	.	.
.	.	.
PROBABLE	.	.
REGULAR	REASONABLE	.
CONTINGENT	TRUE	OBJECTIVE
NATURAL	EMPIRICAL	ANALYTIC
OBSERVABLE	CONTINGENT	ESSENTIAL
EMPIRICAL	GIVEN	NECESSARY
	VALID	

Philosophers 5 and 8 have the same first dimension.
 Perhaps 5's second dimension is the same as 8's third
 dimension?

was done unawares". Here we see how that disjunctive
 dimension comes about: Philosopher 2 ranks the terms from
 high EFFORTLESS to a low UNCAUSED and less low MECHANICAL,
 DETERMINED -- a dimension ranking "easily performed but in

one's control vs. done because of some external reason".

Philosopher 5 ranks the terms from high SPONTANEOUS, EFFORTLESS to low ACCIDENTAL, INADVERTENT, THOUGHTLESS -- a dimension ranking "easily performed but responsible for vs. done unawares".

This illustrates the truth of the remark made earlier that philosophers who specialize in philosophy of mind (like philosopher 2) have learned some subtle thing which is encoded as a ternary vector and which other analytic philosophers have not learned.

Philosopher A has a first dimension very similar to philosophers 2 and 5, but his second dimension is different from their similar second dimension. His second dimension is extraordinarily difficult to interpret: it perhaps ranges from a high "events for which a definite responsibility cannot be ascribed" to a low "events for which a definite responsibility can be ascribed" (although the responsible agent might sometimes be the person, sometimes be an outside force). This kind of dimension might be seen as a result of A's philosophy of religion. A's third dimension is more like 2's than 5's.

Table XIX shows the differences between the typical philosophers 8 and 5 on Science Terms. It will be noted that they have (pretty much) the same first dimension. It runs from a high ANALYTIC, A PRIORI, CONCEPTUAL, less high NECESSARY, THEORETICAL, ESSENTIAL to a low EMPIRICAL, CONTINGENT, PROBABLE less low OBSERVABLE, NATURAL. This

appears to be the same as the first dimension given by the philosophers' INDSCAL analysis. A strong similarity might be noted in 5's second dimension and 8's third dimension, although it would be difficult to say exactly what it is: perhaps "the amount of empirical certainty attached" (but this does not fit philosopher 8's third dimension very well). It is clear that our two typical philosophers use the Science Terms quite differently. (Which fact explains why the INDSCAL analysis has such a lower correlation than the Action Term analysis).

A Look at the Semantic Networks of the Typical Philosophers

Table XX gives the mean scores and standard deviations of the individual Action Terms for our typical philosophers 2, 5 and A. A term which has a low mean score will be one that the philosopher sees as being rather similar to all the rest of the terms, and one which has a high mean score will be one that he views as being dissimilar to the rest. In other words, those terms with the lowest mean scores will, in some sense, define the center of his semantic network, while those with highest mean scores will show the outer limits of his semantic network. This gives us an alternate method of characterizing the semantic network -- one which shows it as a group of concentric circles. Admittedly, such a characterization of the semantic network does not give the detailed internal information garnered from an MDS analysis about the relatedness of the individual terms; but still, it

Table XX: Analysis of Philosophers 2, 5, and A (Action Terms).

<u>Term</u>	<u>Phil.2</u>		<u>Phil.5</u>		<u>Phil. A</u>	
	<u>mean</u>	<u>s.d.</u>	<u>mean</u>	<u>s.d.</u>	<u>mean</u>	<u>s.d.</u>
ACCIDENTAL	3.83	1.99	4.58	2.11	7.33	2.84
CAUSED	4.92	2.47	4.67	2.10	6.75	3.28
COMPELLED	4.92	2.84	4.83	2.59	6.83	3.01
DETERMINED	5.17	2.72	5.00	2.00	7.08	2.97
EFFORTLESS	5.33	2.50	4.67	1.83	7.75	2.99
FREE	5.75	2.45	4.67	2.19	7.42	2.79
INADVERTENTLY	4.50	2.32	4.42	1.88	6.92	3.29
INVOLUNTARY	4.58	2.84	4.75	2.18	6.83	2.95
MECHANICAL	4.67	2.77	4.50	1.73	7.33	2.96
SPONTANEOUS	5.08	2.39	4.67	2.10	7.25	3.25
THOUGHTLESS	3.42	1.78	4.25	1.76	7.00	3.25
UNCAUSED	6.33	2.77	5.17	2.21	7.83	2.55

$r(2,5) = 0.78$; $r(2,A) = 0.54$; $r(5,A) = 0.32$.

MOST CENTRAL:	THOUGHTLESS	THOUGHTLESS	CAUSED
	ACCIDENTAL	INADVERTENTLY	INVOLUNTARY
		MECHANICAL	COMPELLED
MOST PER-	UNCAUSED	UNCAUSED	UNCAUSED
IPHERAL:		DETERMINED	EFFORTLESS
MOST STABLE:	THOUGHTLESS	MECHANICAL	UNCAUSED
	ACCIDENTAL	THOUGHTLESS	FREE
		EFFORTLESS	ACCIDENTAL
		INADVERTENTLY	
MOST VARIABLE:	COMPELLED	COMPELLED	INADVERTENTLY
	INVOLUNTARY		CAUSED
			SPONTANEOUS
			THOUGHTLESS

GENERALLY: Philosopher 2 sees the terms neither as being very similar nor dissimilar in meaning (mean of means = 4.88). He has moderate stability in his judgments of similarity (s.d. = 2.50).

Philosopher 5 sees the terms neither as being very similar nor dissimilar in meaning (mean of means = 4.68). He is very stable in his judgments of similarity (s.d. = 2.05).

Philosopher A sees the terms as being very dissimilar in meaning (mean of means = 7.19). He is very unstable in his judgments of similarity (s.d. = 3.00).

can be of use in characterizing the overall structure and limits of the person's field. As one can see from Table XX, some of the philosophers (here: 2 and 5) see the terms forming their semantic networks as being neither very similar nor very dissimilar (their mean of means are 4.88 and 4.68 respectively). This would mean that, in the overall structure of their networks, the terms are neither "bunched together" nor "spread out". Other philosophers (here: A), on the other hand, see the terms as being very dissimilar (mean of means 7.19). This might mean that they do not view the set as "cohesive" (at least to the extent that 2 and 5 do), and might even argue that, for them, the terms are not really characterizable as falling into any natural grouping (like "action terms"). There is one caveat that must be made here. Since the scales of judgement are not absolute, the difference among the philosophers on this point may be nothing more than response bias for one or the other end of the scale. (I.e., one philosopher may see 5 as the "middle" value meaning "about average" while another philosopher may see 7 as the "middle" value. A bias like this might, I think, account for some of the disparity between our philosophers, but I think it cannot account for it all. After all, they were all given the same instruction set and example, and they were all told to first mark the "1's" and "9's". This surely will give a strong tendency for stablization among the different philosophers, and cannot account for the dramatic differences we have

recorded. However, it must be recognized that we are here making an inference about this -- the data we have do not allow that this is being measured directly.

The standard deviations of the terms might be taken as giving a measure of "how stable" the philosopher is in judging similarity. More accurately, it is a measure of how the philosopher views each of the terms. So, if he thinks that a term has the same distance from each of the other terms, the term will get a low standard deviation score. And if he does this for all the terms, he will get a low overall standard deviation score. However, in these studies, where there is a large number of judgements of similarity to be made, there is a sense in which this really does measure "how stable" the philosopher is in judging similarity. For this reason we shall continue to call it a measure of the stability of judgment, realizing of course that this is an inference doubly removed from any direct measure of the philosopher's actual stability of judgement. In Table XX, it can be seen that philosopher 5 is very stable in his similarity judgments (s.d.=2.05), that philosopher 2 is moderately stable in his similarity judgments (s.d.=2.50), and that philosopher A is markedly unstable in his similarity judgments (s.d.=3.00).

Table XXI: Analysis of Philosophers 5 and 8 (Science Terms).

<u>Term</u>	<u>Philosopher 5</u>		<u>Philosopher 8</u>	
	<u>mean</u>	<u>s.d.</u>	<u>mean</u>	<u>s.d.</u>
ANALYTIC	4.29	2.31	3.90	2.34
A PRIORI	4.33	2.03	4.33	2.67
CONCEPTUAL	4.29	2.00	4.10	1.95
CONTINGENT	4.95	2.60	4.52	2.40
CONVENTIONAL	4.43	1.63	4.71	1.90
EMPIRICAL	4.14	2.56	4.14	2.17
ESSENTIAL	4.71	2.08	3.52	1.78
GIVEN	4.05	1.60	4.57	2.34
HYPOTHETICAL	5.05	1.69	4.95	2.16
LAWLIKE	3.86	1.62	4.62	1.80
NATURAL	4.05	1.53	4.19	1.66
NECESSARY	4.57	2.44	4.24	2.32
OBJECTIVE	3.29	1.68	4.10	1.55
OBSERVABLE	4.38	2.09	5.14	2.31
PROBABLE	5.29	2.22	4.43	1.86
REASONABLE	3.81	1.50	3.67	1.28
REGULAR	3.81	1.36	3.95	1.40
SUFFICIENT	4.76	1.37	4.95	1.69
THEORETICAL	4.90	1.92	3.57	1.66
TRUE	4.14	1.49	3.90	1.87
VALID	3.95	1.91	5.43	2.16

MOST CENTRAL: OBJECTIVE

ESSENTIAL
THEORETICAL
REASONABLE

MOST PER-
IPHERAL: PROBABLE
HYPOTHETICAL

VALID
OBSERVABLE

MOST STABLE: REGULAR
SUFFICIENT

REASONABLE
REGULAR

MOST VAR-
IABLE: CONTINGENT
EMPIRICAL
NECESSARY

A PRIORI

Generally: Philosopher 5 sees the terms as somewhat more similar than dissimilar (mean of means=4.34). Very stable in his judgments of similarity (s.d. = 1.88).

Philosopher 8 sees the terms as somewhat more similar than dissimilar (mean of means=4.33). Very stable in his judgments of similarity (s.d. = 1.96).

CHAPTER IV

SOME CONCLUDING REMARKS

The results are, in themselves, interesting, I think. But of broader interest are the possibilities opened up by MDS and the related techniques mentioned in this thesis for investigating various areas of study. I think it is clear that MDS is to be recommended as an investigative tool -- superior to the introspective analyses now used -- for componential analysts. It has application also in the study of "pseudo agreements/disagreements" among professionals of various social science fields.¹ For example, it seems that politicians might very well appear to agree (or disagree) on such terms as 'conservative', 'liberal', 'socialist', and the like, when in fact there is strong disagreement (or agreement) in their second and third dimensions. Not only is the study of subjective meaning of use in the "practical" fields like politics, but it might also be useful in the study of the subjective lexicons of such social scientists as anthropologists, sociologists, political scientists, and so on.

Another area that the method might be of use is in

¹ For an explanation of "pseudo agreement/disagreement" together with an extended study of one amongst businessmen and politicians, see Tennessen (1959) and the studies reported therein.

psychoanalytic evaluation. Suppose, for instance, that a patient were given a set of emotion terms such as LOVE, HATE, SEX, GREED, etc. One might conjecture that it could be quite revealing of important psychological traits that a person has, for example, LOVE and HATE close together on some dimension, whereas other people have LOVE and HATE rather far apart on all dimensions.

However, from the broadest theoretical point of view, of paramount interest is the issue of innatism with respect to word meaning or word connotation. I think this preliminary investigation lends considerable support to the view that (if this conception of the subjective lexicon is accepted) a strict innatism of the form adopted by such linguists as Katz and Leech is empirically false. Let us review briefly how this conclusion was arrived at.

We started by considering the possibility of two people having different subjective impressions when exposed to the same quality, and we quickly moved to consider the more general case of people having different concepts or connotations or meanings attached to the same term. It seemed offhand that it was not an impossibility that this could be the case, and be the case in such a way that one's

ordinary verbal behaviour could never make it become known.¹

The conception of one's subjective lexicon which allows this possibility was called 'privatism'. Privatism is bolstered by a plausible account of language learning we called 'empiricism': the view that, at childhood, the mind is, as it were, a blank tablet and one's experiences etch upon this tablet to form the concepts, connotations, and meanings he will associate with various words.

Finally, we considered the popular conception of communication whereby it amounts to a speaker having a concept or connotation or meaning or intention (or some combination of these), the speaker encoding this into language in accordance with the way he learned the terms, the hearer decoding this in accordance with the way he learned the terms and forming a concept or connotation or meaning (or some combination of these). True communication occurs when the hearer's mental state is the same as (or maybe: equivalent to, isomorphic to, etc.) the speaker's. It was then noted that this kind of empiricism with respect to language learning and this conception of successful communication lead naturally to the view that we rarely (if

¹ That is, if the term in question were, e.g., 'dog', we could never tell by our behaviour that we had differing concepts, because we always happened to call the same things dogs. The case is perhaps clearer with colour terms: it does not seem impossible that my subjective sensation of red is different from yours, but systematically different, so that we always call (say) the top traffic light 'red' and the bottom one 'green'.

ever) have true communication since our childhood experiences are so varied; and even if we do, we would never know it. Various thinkers from many different fields who have held this privatist view were canvassed.

One popular point at which to challenge this view and its undesirable conclusion is at its account of language learning. We therefore distinguished a view of the human mind according to which it is not a blank tablet waiting for experience to etch upon it, but rather was a block of veined marble upon which experience chiseled. Even though our childhood language learning experiences might be somewhat different, so long as they are fairly similar, the fact that we have the same veins in our mental marble will guarantee that we will arrive at the same concepts or connotations or meanings associated with all our ordinary terms. This view is innatism, and in the area of lexical semantics has been explicitly championed by such philosophico-psychologico-linguists as Katz, Fodor, and Leech. Other linguists have offered arguments for the innateness of syntactic structures; such arguments, it seems, could easily be adapted to lexical semantics. It thus seems that innatism with respect to the lexicon -- the meanings or connotations or concepts that an individual associates with individual terms -- is a view that has many advocates.

Thus, both views have an ideal of what true communication is. The one view says that it is never achieved because of such-and-so facts about language

learning (empiricism); the other view says that since it is achieved, we must embrace a different conception of language learning (innatism). I stepped between the two views by denying the ideal of "true" communication. The theory of a lexicon I explicated (a rather common view) allows for "slack" in the "identity" (or "isomorphism", or "equivalence") of the speaker's and hearer's mental structures. It does this by positing that the lexicon is composed of a series of networks of "dimensions" of meaning. Each term in the network is to be characterized by means of these dimensions and the term's "distance" from other terms along these dimensions. Thus communication is successful if the hearer's constructed network is "close" to the speaker's.¹

We see, therefore, that we could have the innatist's conclusion that communication is possible and eat the empiricist's plausible language learning cake too. But, we still would wonder, who is correct about language learning? Do we have innate lexical structures? Given the present conception of the subjective lexicon, we are able to investigate the structures of different peoples' subjective lexicons by means of the statistical techniques of MDS and INDSCAL and tell whether they are the same or different.

¹ Or, one should perhaps say, even if this is not "perfect communication", it is close enough to it so as not to give rise to the feeling of revulsion we have for the privatist's conclusion that we "really" do not ever understand one another.

This will aide us in deciding; for innatism says that people with similar but non-identical experiences will have the same subjective lexicons, while empiricism says that there will be a monotonic gradation of differences -- the more distinct the experiences, the more distinct the subjective lexicons.

Our primary sample, a group of ten professional philosophers, have experiences relevant to the philosophic terms being considered. And these experiences can independently be judged according to degree of similarity to one another. It was found that (a) even very similar experiences produce somewhat dissimilar networks, (b) the more similar two peoples' experiences are, the closer their networks are to one another, and consequently, (c) groups whose members have similar experiences tend to "clump together" and be quite different from other groups all of whose members have similar experiences.

It is therefore shown that innatism of lexical structures, when taken as a theory that has empirical reflexes, is false. In their belief that it is needed to account for language learning and communciation, such theorists as Katz, Fodor, and Leech are not just misguided, but conclusively wrong. However, innatism need not be taken as a theory that has empirical reflexes of this nature. We have not investigated this non-empirical theoretical innatism in this thesis; nor is a work in the sciences, even a social science, the proper place to carry out such an

investigation. Such a task can best be left for the philosophers.

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